This is a digital copy of a book that was preserved for generations on library shelves before it was carefully scanned by Google as part of a project to make the world's books discoverable online.

It has survived long enough for the copyright to expire and the book to enter the public domain. A public domain book is one that was never subject to copyright or whose legal copyright term has expired. Whether a book is in the public domain may vary country to country. Public domain books are our gateways to the past, representing a wealth of history, culture and knowledge that's often difficult to discover.

Marks, notations and other marginalia present in the original volume will appear in this file - a reminder of this book's long journey from the publisher to a library and finally to you.

Usage guidelines

Google is proud to partner with libraries to digitize public domain materials and make them widely accessible. Public domain books belong to the public and we are merely their custodians. Nevertheless, this work is expensive, so in order to keep providing this resource, we have taken steps to prevent abuse by commercial parties, including placing technical restrictions on automated querying.

We also ask that you:

+ *Make non-commercial use of the files* We designed Google Book Search for use by individuals, and we request that you use these files for personal, non-commercial purposes.

+ *Refrain from automated querying* Do not send automated queries of any sort to Google's system: If you are conducting research on machine translation, optical character recognition or other areas where access to a large amount of text is helpful, please contact us. We encourage the use of public domain materials for these purposes and may be able to help.

+ *Maintain attribution* The Google "watermark" you see on each file is essential for informing people about this project and helping them find additional materials through Google Book Search. Please do not remove it.

+ *Keep it legal* Whatever your use, remember that you are responsible for ensuring that what you are doing is legal. Do not assume that just because we believe a book is in the public domain for users in the United States, that the work is also in the public domain for users in other countries. Whether a book is still in copyright varies from country to country, and we can't offer guidance on whether any specific use of any specific book is allowed. Please do not assume that a book's appearance in Google Book Search means it can be used in any manner anywhere in the world. Copyright infringement liability can be quite severe.

About Google Book Search

Google's mission is to organize the world's information and to make it universally accessible and useful. Google Book Search helps readers discover the world's books while helping authors and publishers reach new audiences. You can search through the full text of this book on the web at `http://books.google.com/`

3 3433 06906609 4

VEA
+
Stone

STONE.

An Illustrated Magazine.

VOLUME ~~XVII~~ 14.

DECEMBER, 1896, TO MAY, 1897.

CHICAGO, ILL.:
THE D. H. RANCK PUBLISHING COMPANY.
1897.

THE NEW YORK PUBLIC LIBRARY
789936
ASTOR, LENOX AND TILDEN FOUNDATIONS.
1897.

THE ASTOR LIBRARY
NY

INDEX.

AMERICA, Architecture In..... 255
American Railway Indebtedness 86
Ancient Cities of the Old World —Cyrus K. Porter..... 574
Alumina in Quarries..... 595
Arch, Circle on Circle—Illus..... 467
Architecture, Stone In—John Colter Pelton..... 569
Architects of the Hall of History, The. 57
Aberdeen, Notes from— 56, 171, 276, 381, 469, 590
Architectural Drawing, Instruction in —Illus.—Prof. Wm. R. Ware— 1, 113, 217, 325, 470
Architecture, Art and—Fred'k Baumann..... 333
Architecture in America..... 255
Architecture; Pyramids and their Relation to Monumental and Sacred—Cyrus K. Porter..... 440
Arch, Setting Out a "Battered"—Illus. 257
Art and Architecture—Frederick Baumann..... 333

"BATTERED" Arch, Setting Out a—Illus..... 257
Belguim. Quarries in..... 348
Blacklists, Corporation..... 457
Books and Periodicals— 82, 192, 287, 404, 508, 607
Bridges, Formation of Natural..... 355
Bridges, Masonry for—Illus.—C. E. Fowler..... 373
Bridges, the Historical Development of Stone — Illus. — Prof. Geo. F. Swain..... 229
Builders, United States Engineers as.. 475
Building Stones of New England, The —Illus.—Wm. Beals, Jr..... 544

CANADA'S Tariff on Slate..... 459
Cement for Anchoring Bolts in Stone, Portland..... 24
Centering Perronet's Method of Striking..... 382
Central Maryland Granites—Charles R. Keyes.....20, 126, 226
Circle on Circle Arch—Illus..... 467
Cities of the Old World, Ancient—Cyrus K. Porter..... 574
Colorado, The Undeveloped Economic Resources of—Illus.—A. Lakes..... 358
Contract, A..... 86
Contract News.....295, 395, 510, 618

CONVENTIONS

The Iowa Dealers..... 274
Retail Monument Dealers of Illinois 486
Corporation Blacklist..... 457

CORRESPONDENCE

May—
Notes from Aberdeen..... 590
A Tombstone Scandal..... 591
A Pertinent Suggestion..... 591
Wholesaler and Middleman..... 592
Curvature, Setting Out Work of Double—Illus..... 52

DINGLEY Tariff Bill, The..... 484
Double Curvature, Setting Out Work of..... 52
Drawing, Instruction In Architectural —Illus—Prof. Wm. R. Ware— 1, 113, 217, 325, 470

ECONOMIC Resources of Colorado, The Undeveloped — Illus. — A Lakes..... 358
Engineers as Builders, United States.. 475
England Granite Country, The West of—Illus.—Arthur Lee..... 155, 433
Exports Declared (Imports to) for the United States..... 54

FOREIGN Trade in Stones, etc., Our.....60, 173, 275, 384 491
FRONTISPIECES
Joinery.....December
The Quarry Team.....January
Painting.....February
Textile Decoration.....March
On the Moors, Near Chagford, Dartmoor, England.....April
Arborculture.....May

GEOLOGY for Quarrymen—Illus.—Charles R. Van Hise—26, 134, 260, 349, 487, 586
Georgia Marble..... 146
Georgia Quarry, To Open a..... 161
Glasgow, Scotland, Trade Notes from 169
Good Roads..... 173
Granite Country, The West of England—Illus.—Arthur Lee..... 155, 433
Granites, Central Maryland—Charles R. Keyes.....20, 126, 226

HALL of History, The Architects of the..... 57
Highways, Usefulness of Various Kinds of Stone for..... 380
Historical Development of Stone Bridges, The—Prof. Geo. F. Swain—Illus..... 229

INSTRUCTION in Architectural Drawing—Illus.—Prof. Wm. R. Ware—.....1, 113, 217, 325, 470
Interior Work, Marble in..... 18
Imports of Stone in Past Thirteen Years..... 172
Ireland, Roofing Slate in..... 476

LAW, It is the.....110, 216, 504
Lettering Marble Monuments.. 585
Limestone Formation, The Niagara..... 129

MACHINERY AND SUPPLIES—
January—
A Unique Paper Weight.... 187
Lidgerwood Manufacturing Co... 187
C. L. Batchelder..... 187
Jos. Dixon Crucible Co..... 189
Clayton Air Compressor Works... 189
The New Albany Manufacturing Co..... 189
Manufacturers' Advertising Bureau 190
Verd-Antique Marble Co..... 190
Messrs. W. A. Crook & Bros. Co.. 190
The Trenton Iron Co..... 190
February—
Victory for the Boyer Pneumatic Hammers..... 291
Bedford Quarries Co..... 293
Saw Blades..... 293
An Invention that Promises to Revolutionize Stone-Cutting... 294
March—
Change of Name..... 402
Enjoined..... 402
Change of Firm Name..... 402
April—
Slate for Roofing..... 505
Litigation Ended—Illus..... 505
May—
Electricity in Belts..... 614
American Hoisting Machinery in Japan..... 614
Willis Shaw, Contractors' Machinery..... 614
The Temperely Transporter..... 614
Remarkable Stone Sawing..... 615
Pneumatic Falsehoods Corrected. 615
The Chouteau Hammer..... 616
John Maslin & Son..... 616
Dobbie Foundry and Machinery Co..... 616
Marble Business, Difficulties in the... 572
Marble, Georgia..... 146
Marble Hills, The Vermont..... 165
Marble in Interior Work..... 18
Marble Monuments, Lettering..... 585
Marble, South Carolina..... 125
Maryland Granites, Central—Charles R. Keyes.....20, 126, 226
Masonry for Bridges—Illus.—C. E. Fowler, C. E..... 373
Massachusetts Legislators, Mediæval. 485
Mexico, Method of Transporting Stone in..... 75
Minnesota Quartzite—H. W. Winchell 122
Minnesota Sandstones..... 40

MISCELLANY, SELECTED—
December—
The Growing Use of Gas and Oil Engines..... 65
Our Earliest Currency..... 65
Archæology of Ireland..... 66
Tombs of Extraordinary Cost.... 66
The Dolmens of Brittany..... 67
Rope Driving..... 68
How Talc is Quarried..... 68
A Refuge for the Defeatnd Politician..... 69
Valuable "Finds" in Canada..... 69
January—
How Emery is Quarried..... 179
The "Capitalist" Delusion..... 179
Stone Crushing Plan..... 180
Employer's Liability for Employe's Injury..... 180
Training School for Granite Workers..... 181
Satyr and Satire in Marble..... 181
The Two Great Facts of the Labor Question..... 182
February—
Colossal Statues..... 282
Pope on Good Roads..... 282
The Coxey Quarry Trouble..... 283
Steel and Corundum Compared... 283
The Commercial Geography of Europe..... 283
Touching Rural Obituary..... 284
Roman Monoliths..... 284
Screws in Stone Walls..... 284
Lord Penrhyn and His Slate Workers..... 285

Prehistoric Honey Found in a Stone Quarry..... 286
Testing the Strength of Soil for Building..... 286
March—
Indian Mortar..... 390
Mediæval Mosaics..... 390
Electrical Influence on Steam Engine Design..... 390
Architecture of the Nineteenth Century..... 391
How Indians are Named..... 391
How Monopoly Retards Improvement..... 392
Mediæval Use of Stone..... 392
Failure of State Ownership..... 393
Mineral Wool..... 393
Great Combinations Have Raised Wages..... 394
Granite and Brick Pavements..... 394
April—
The Oldest Organized Trade in the World..... 496
Ancient Roman Tombs..... 496
Foolish Criticism of the Rich.... 497
Corrosion of Iron in Stone Work. 497
Prehistoric Stone Quarry Opened.. 498
Wonderful Things That are Near.. 498
Verd-Antique Marble..... 499
Find of Black Granite..... 499
May—
The Highly Prized Thessalian Marble Discovered..... 603
Railway Law Decision..... 603
Eastern Manufacturers Want Gypsum Kept on Free List..... 604
Fairy Stones in Virginia..... 605
Sarcasm and Statues..... 605
Simple Tests for Lubricating Oils. 606
Monumental and Sacred Architecture, Pyramids and Their Relation to—Illus.—Cyrus K. Porter..... 440
Monuments, Lettering Marble..... 585
Monument, The Washington..... 369
Middleman, Wholesaler and..... 592

NATIONAL Union, The Quarriers. 276
Natural Bridges, The Formation of..... 355
New England, The Building Stones of—Illus.—Wm. Beals, Jr..... 544
Niagara Limestone Formation..... 129
"Nigger Heads," Turtle Stones, etc., Explained—Illus..... 271

OLD World, Ancient Cities of the—Cyrus K. Porter..... 574
Onyx and Sardonyx, The—Agnes Hume..... 143
Ornamental Work..... 438

PATENT RECORD, OUR.
December—
Repeal of Patents..... 70
Stone-cutting Machine—Illus..... 70
Stone Lewis—Illus..... 72
Attachment for Stone-Planing Machines—Illus..... 72
Stone-Working Machinery—Illus... 74
January—
Machinery for Working Stone, etc.. 182
Stone-Working Machinery and Rubbing Bed-Plate Therefore..... 182
February—
Several Pneumatic Tools—Illus..... 288
April—
Planer for Dressing Stone—Illus... 500
Machine for Molding and Dressing Stone for Buildings, etc.—Illus... 500
May—
Second Series of Pneumatic Tools... 608
Perronet's Method of Striking Centering..... 382
Pneumatic Tools, Second Series of.... 608
POETRY
And There Are Others..... 78
Portland Cement for Anchoring Bolts in Stone..... 24
Power Transmission, Rope..... 45
Pumps, Van Duzen Steam Jet..... 86
Pyramids and Their Relation to Monumental and Sacred Architecture—Illus—Cyrus K. Porter..... 440

QUARRIERS National Union, The 276
Quarries in Belguim..... 348
Quarry and Shop, Notes from—90, 196, 306, 406, 522, 626
Quarries, Alumina in..... 595
Quarryman, A Pioneer Western..... 170
Quarryman, The Tramp..... 147
Quarrymen, Geology for—Illus—Chas. R. Van Hise.....26, 134, 260, 349, 487, 586
Quarry, To Open a Georgia..... 161
Quartzite, Minnesota—H. W. Winchell 122

RAILWAY Indebtedness, American..... 86
Roads, Good..... 173
Rocks, Overwhelming Testimony of.. 570
Rocks that are Now Forming—Oscar C. Salyards..... 163
Roofing Slate in Ireland..... 476
Roofs, Flat Slate..... 596
Rope Power Transmission..... 45

SANDSTONES, Minnesota..... 40
Sardonyx, The Onyx and—Agnes Hume..... 143
Saw Blade, An Improved Stone—Illus 44
Scotland, Trade Notes from Glasgow.. 169
Sculpture, Colored..... 370
Serpentine—Harriet E. Wilson..... 58
Serpentine Discovery, A New..... 172
Silica in Stone..... 474
Singer, Horace M. (Portrait). A Pioneer Western Quarryman..... 170
Slate, A Boon in..... 383
Slate, Canada's Tariff on..... 459
Slate in Ireland, Roofing..... 476
Slate Production in the United States in 1896..... 458
Slate Roofs, Flat..... 596
South Carolina Marble..... 125
Spectacles for Workmen Protective... 277
Steel Frames of Tall Buildings Last? How Long Will the..... 264

Stone Bridges, The Historical Development of—Illus.—Prof. Geo. F. Swain 229
Stone Cutting, Problems in—Illus— 52, 257, 467
Stones, etc., Our Foreign Trade in— 60, 173, 275 384, 491, 597
Stone for Highways, Usefulness of Various Kinds of 380
Stone in Architecture—John Cotter Pelton 569
Stone in Mexico, Method of Transporting 75
Stone in the Past Thirteen Years, Imports of 172
Stone, Mediæval Employment of 379
Stone, Portland Cement for Anchoring Bolts in 24
Stone Produced in 1894 and 1895, Value of Different Kinds of—Wm. C. Day— 15, 130, 265, 377, 460
Stone Saw Blade, An Improved—Illus. 44
Stone, Silica in 474
Stones of New England, The Building —Illus.—Wm. Beals, Jr 544
Stone vs. Terra Cotta 37
Suggestion, A Pertinent 591

TARIFF Bill, The Dingley 484
Terra Cotta, Stone vs 37
TIMELY TOPICS
December—
The Ohio Sandstone Sensation 61
Tarriff and the Stone Industry 62
The Bogus Wholesaler and the Retail Dealer 63
Romance and the Quarries 63
Georgia Marble Deposit 64
Personal Liberty and the Smoker. 64
January—
The Folly of State "Tariffs" 174
The Use of Marble 175
Advice on Advertising 175
Capable Managers in Demand 176
Our Frontispiece 176
Foreign Trade in Machinery 176
The Farcical in Contract Letting 177
Quarryman and Quarrier 177
Is There Trouble Ahead 178
February—
The Mexican Boundary 278
Organized Labor at Lettings 278
A Sample of Honest Stone Construction 279
Lien Law on Monuments 279
The Tyranny of Strikers 280
The Emigration Eastward 281
The New Tariff 281
March—
The Blacklist Again 385
The Skyscraper 387
Coöperation 387
"Natural Sap" 388
A Tombstone Scandal 388
Paternalism and Policy 389
According to Webster 389
April—
The Middleman 492
Retail Dealers Combine 493
Tariff Reform 493
Progress in Use of Stone 494
Capital and Labor 495
A Growing Habit 495
May—
The Senate Tariff Bill 599
Durability of Stone 599
The Strength of Stone 599
Variation in Stone 600
Hobson's Choice 600
The Outlook for Building 601
The Supervising Architect 601
Channeler and Drill 602
The Aesthetic Sense 602
"Tombstone Scandal, A" 591
Transmission, Rope Power 45
Turtle Stones, etc., Explained, "Nigger Heads"—Illus 271

UNITED States in 1896, Slate Production in the 458

VAN Duzen Steam Jet Pumps 86
Vermont Marble Hills, The 165

WASHINGTON Monument, The 369
Western Stone Company in 1896 254
"Wholesaler" and "Middleman" 592
Will not Secede 129

Try

ASHBURTON MARBLE

As a Decorative Material.

COLOR:

Dark grayish purple ground, interlaced with a net work of red and white veins.

CAN BE OBTAINED IN BLOCKS OF LARGE SIZE.
TAKES A BEAUTIFUL POLISH.

It is quarried in Devonshire and shipped F. O. B. Bristol, by

ARTHUR LEE & BROS., LTD.,

Marble and Granite Merchants ....

BRISTOL, - - ENGLAND.

THE NEW YORK
PUBLIC LIBRARY

ASTOR, LENOX AND
TILDEN FOUNDATIONS.

THE NEW YORK
PUBLIC LIBRARY

ASTOR, LENOX AND
TILDEN FOUNDATIONS.

From the wall painting in the Hotel De Ville, Paris

JOINERY.

By P. V. Galland

Reprint from *The Architect*, London

STONE

VOLUME XIV. DECEMBER, 1896. NUMBER 1.

INSTRUCTION IN ARCHITECTURAL DRAWING.*

THE drawing done by an architect lies midway between that of the artist and that of the engineer, being controlled partly by considerations of fact and partly by regard for the appearances of things; partly by geometrical conditions, and partly by the skill and judgment of the draughtsman. In executing them he is accordingly at once an artist and a mathematician. He handles his instruments of precision, his T-square, triangle and dividers, with as free a touch as the painter his pencils and brushes, and on the other hand subjects his free-hand work to a constant process of reasoning and measuring, and though without scale or compasses, never lets his Euclid go out of his mind.

Of these two procedures we give precedence in time and in importance to the last. We begin, to be sure, with the use of mathematical instruments, so as to establish at once a certain standard of exactness. But we discontinue their use as soon as possible and find every advantage in doing everything free-hand until most things are done. For the draughtsman who has been trained only with the dividers and ruling-pen, however skilful he may become, is as helpless when they are not at hand as he was before he began to learn their use, while the man who can do whatever needs to be done without them has no difficulty in doing it with them. They come to him then as helps and auxiliaries, which is what they should be, not as necessaries. He is thus saved that early experience of anxiety and caution in their use which produces a hard and timid drawing at the hands of a hard-fisted and merely mechanical draughtsman.

*Original in *School of Mines Quarterly*. Revised copy furnished STONE by author.

Mechanical drawing being thus eliminated, as a special branch of study and discipline, and left to be taken up when occasion requires, and when it will present no difficulty, what remains falls naturally under half a dozen different heads—tracing, copying, graphical construction, graphical discussion, pen-work, brush-work, out-door sketching, and the study of the orders. Under all of these, as in all endeavor, there are to be recognized the two elements, familiar in the Latin Grammar as the object or end, and as the manner, means and instrument by which the end is to be attained. There is the definite conception of the form to be depicted, which is the intellectual and imaginative element—and there is the skill in execution by which the disciplined eye and hand are enabled to realize this conception. The draughtsman has first to get a clear idea of the shapes to be delineated, and then has to compel his hand to the adequate representation of it.

There are in their nature two separate tasks, and for beginners to attempt them both is, in general, and in the case of all but a few specially gifted persons, too much to undertake at once. We accordingly treat them separately. This is effected by beginning the study of draughtsmanship with tracing.

I.—TRACING.

In tracing, which is drawing upon transparent paper laid over the "copy," the question what to do does not arise, since there is no uncertainty as to the size, shape or position of the lines to be made. Substantial accuracy of form is secured in advance, and it would seem as if a merely mechanical fidelity would suffice to produce a *fac-simile*. But in a work of art, every line, besides shape and position, has a spirit and character of its own, and to seize and reproduce this is enough to occupy the beginner's best attention. Even when, as is generally the case, a line needs to be perfectly even and uniform from end to end, and as it were, to possess no individuality of expression at all, this negative character is one which it requires care to secure. The tracing paper thus relieves the student of responsibility for one-half his task, only that he may devote himself the more efficiently to the other half. At the same time the lines beneath his paper secure him from disaster, and this assurance gives him confidence and courage to attack the task which remains, a task which after all comprehends the main substance of the matter. For in the practice of tracing we require that the forms shall be as fully analyzed as if they were to be drawn from memory, and the lines made of as fine a quality as the student can command, and with as much purpose as if the work were a work of original design. Instead of crawling along the line, as a child works with his transparent slate, our men are taught to trace with the same animation and spirit as if the original were not immediately under their hand. They soon find that a tracing may be as brilliant and effective as a copy. The only difference is that there is greater facility

PLATE I.—TRACING FROM PHOTOGRAPH. B. W. M.
Reduced in size about one-third.

and boldness in the procedure and more accuracy in the result. (Plate 1.)

This sort of tracing exacts the closest care and attention. It trains the hand, gives acquaintance with form, and teaches just what it is important to do and what it will do to leave undone. Thought and feeling are indeed so far from being replaced by a dull mechanical procedure, that they are, on the contrary, made only the more intelligent and sensitive by being concentrated upon a limited task.

Most of this work is done with the pen, pencil-marks upon tracing-paper being neither distinct nor durable. The outlines of course are traced, from prints or photographs, just as they are found. But the shading, even in the case of wood-cuts, is not textually reproduced, the forms of the shades and shadows being rendered by a series of flat tints. These are sometimes put in with the brush, but more often with the pen, parallel vertical lines being employed just as in drawing. This work is indeed, both in the outline work and in the shading, an admirable introduction to draughtsmanship with pen or pencil. The brush is in constant use, however, in making tracings of examples of colored decoration from prints of Egyptian tombs, Greek vases, or tiles and terra cotta of every period. The outlines are then sometimes drawn with the pen and filled in with color, which is often laid on the other side of the paper. But these may be dispensed with and the tracing made with the brush altogether. This is particularly effective in tracing anthemions and honeysuckle work from Greek vases, and in this work Japanese brushes prove specially serviceable.

These exercises are immediately utilized in the service of the historical studies which compose a chief part of our course. While practicing the essential principles of draughtsmanship in making tracings from drawings, engravings and photographs, our students are at the same time accumulating valuable memoranda for future reference. The tracing books in which this work is stored away become, before the end of the course is reached, a priceless possession. (Plate II.)

To this end we have accumulated a considerable mass of material illustrative of Architectural History. Part of this is of the nature of a gigantic scrapbook, and consists of innumerable portfolios full of prints and engravings, picked up at random as chance may offer, and mounted on cardboard for safer handling. But the chief part and the most useful part of this collection consists of the plates of standard architectural works mounted in like manner. Plates which in a bound volume can be used by only one student at a time are thus made simultaneously accessible to a hundred.

There would seem to be no reason why this procedure should not be equally serviceable in any school. While learning to draw in the most efficient way, classes in geography, natural history, and physics, could easily accumulate an invaluable illustration of the matters in hand.

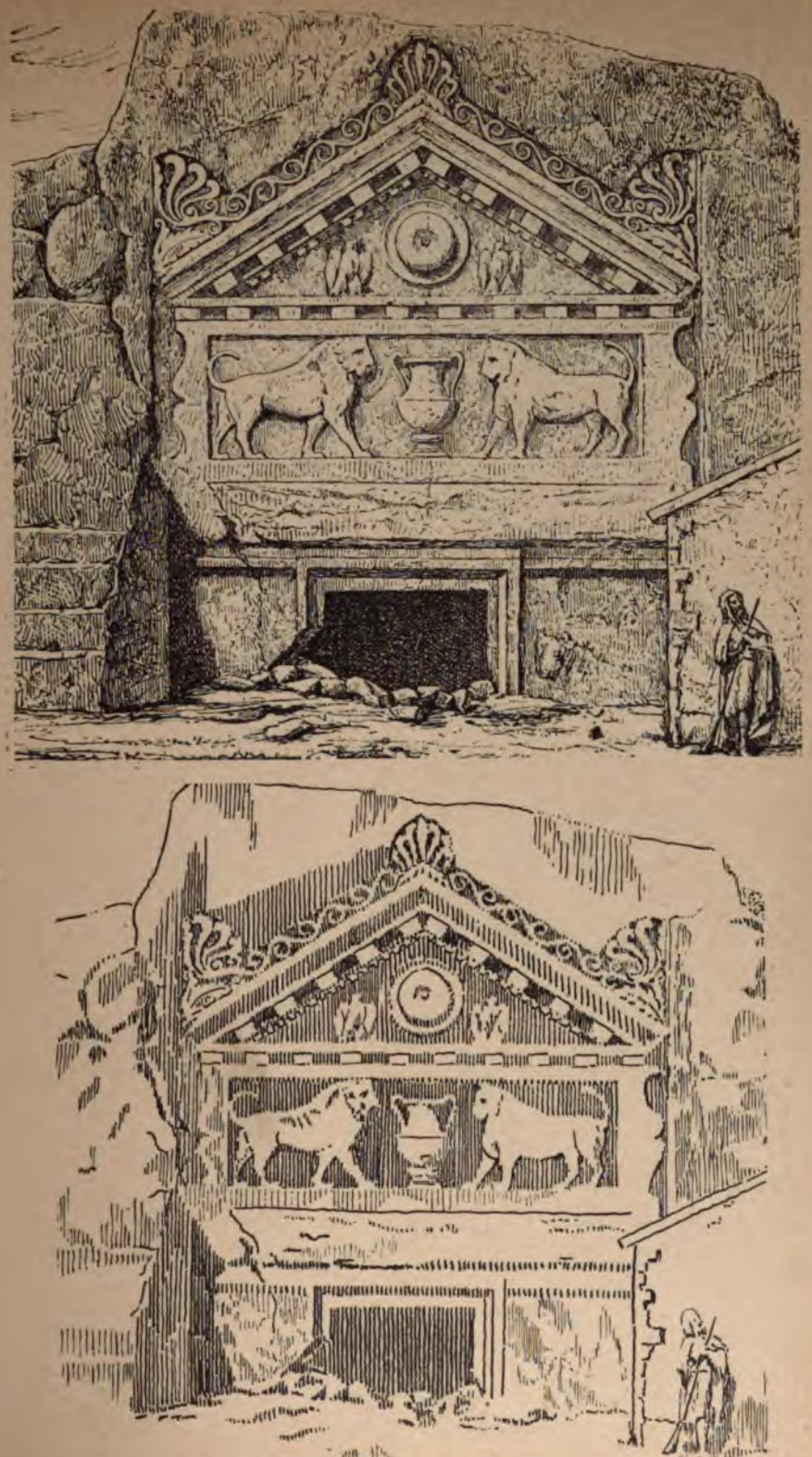


PLATE II.—TRACING FROM A WOOD CUT. W. D. A.

In Illustration of the History of Architceture. (About the size of the originals.)

II.—COPYING.—OUTLINES AND SHADING.

The training of hand and eye, which result from these exercises in tracing, prepare the student to copy with accuracy and intelligence whatever forms may come before him, whether presented in the flat or in the round, so far at least as concerns the mere execution of the lines. Tracing makes him acquainted with a variety of forms and the way of presenting them, and enables him to delineate them with a firm and workmanlike touch, but it affords, of course, no practice in the determination of shapes and sizes, and of the proportions and relative positions of the objects to be drawn. In copying, however, whether one is drawing from the round or from the flat, this determination of the outline is one's first concern. But it is so difficult a matter that it engrosses all one's attention, and it is well accordingly for the beginner to defer copying until, as thus by the practice of tracing, some manual dexterity and some critical appreciation of form have been acquired.

The accuracy of observation and quick sympathy of hand and eye needed accurately to reproduce the contours set before them, come to some persons as a natural endowment, while others can acquire them only by long and laborious practice. To such persons the exercises in graphical construction, described in some later paragraphs of this paper, are of special service. Like the preliminary surveys of an engineer, they serve to fix certain landmarks and enable him to block out his work. But it is not necessary, in copying drawings, photographs and prints at least, to put off the achievement of work really worth achieving upon subjects really worth working upon, until this skill in drawing outlines has been attained. For the student who is skilled in tracing is in a position to avail himself at once of the devices of transferring and squaring, and of the pentagraph and camera lucida, mechanical aids to which artists habitually resort to secure accuracy of form, but which, though they are by no means wholly mechanical, it is somewhat the custom of the schools to neglect, or even to disparage.

In transferring, the outline is first traced, then gone over with a soft pencil or charcoal on the other side of the tracing-paper, and then transferred to the paper on which the drawing is to be made by going over it a third time. It then, of course has to be drawn a fourth time, more carefully still. This repetition affords in itself a valuable discipline.

In squaring, a rectangular network of lines—threads, wires or pencil marks on tracing paper—is laid over the original, a similar network is drawn on one's paper, and then the outline is copied one square at a time. A task which is a hundred times too difficult to undertake may thus, if divided into a hundred separate undertakings, be brought within the reach of powers still undeveloped. Each square presents simple lessons of its own which are just as instructive as if it were not part of a whole, and they may be made more instructive still if the second network is laid out to a larger

PLATE III.—BRUSH-WORK FROM PHOTOGRAPH AND FROM DRAWING, THE OUTLINES TRANSFERRED BY TRACING, AND REDUCED IN SCALE BY SQUARING. R. A. MCC., S. G. S. (About two-thirds the dimensions of the originals).

or smaller scale than the first, so that the drawing is reduced, or, still better, enlarged, in size. (Plate III.)

It is one of the advantages of drawing from the flat that it makes the beginner, while slowly acquiring the judgment and skill which shall enable him at last to dispense with these helpful devices, to push on immediately to other equally important matters, such as the study of light and shade, modeling, values, and the relations of things. It thus opens to him the whole world of representative art as a field of endeavor instead of confining him, as drawing from the object must otherwise confine him for a long time, to forms which, if they are simple enough to come within the capacity of his hand, are likely to be too simple to satisfy the desires of his mind, such as cubes, pyramids and cylinders.

The pentagraph answers the same purpose. It is by no means an automatic machine, and like tracing, requires to produce a good result all the draughtsmanship one has at command. The same is to be said of the camera lucida, the manipulations of which are a little more difficult, and which for objects in the round renders the draughtsman a somewhat similar service.

But the outline gives the form of an object in only two dimensions. The third dimension can be shown only by shading, which by representing the play of light and shade within the outline indicates the modeling of the surface. Completely to convey all the delicate gradations of tone which the practiced artist learns to perceive, requires the delicacy of touch which only the long practice of the studio can give. This is so much beyond the skill of the beginner that in all schools of drawing the beginner is warned not to attempt it, and is instructed in treating his lights and shades, to confine his attention to the main masses. He is told to simplify his task by dividing the surface into a certain number of fields, each of which may be regarded as virtually a plane surface, more or less exposed to the light, and may accordingly be represented by a flat tint of the proper grade. This compels a discriminating study of the form to be depicted and at the same time diverts attention from unimportant points of detail.

The subdivisions may be few or many, according to the scale of the drawing and the amount of detail which it is desired to render. Careful discrimination is needed, of course, to get them all of the right shape and size, and of the right tone, or, as the artists say, of the proper *value*. The more numerous the planes, the more delicate the analysis and the more subtle the differences. Objects in the sunlight, if drawn upon a small scale, may be effectively represented, as we have seen, by rendering the whole of the dark or shaded side by a single uniform tint. But whether the subdivisions are few or many, each is shown as a plane. They give, of course, only an approximation to the real form, but the approach may be made as close as one chooses by increasing their number. (Plate IV.)

THE NEW YORK PUBLIC LIBRARY
ASTOR, LENOX AND TILDEN FOUNDATIONS.

PLATE IV.—PENCIL WORK FROM LITHOGRAPH. HEAD OF FAUSTINA. A. R.
The lithograph reduced about two-thirds, the drawings one-third.

PLATE V.—PENCIL WORK FROM LITHOGRAPH BY JULIEN. LION'S HEAD BY JEAN GOUJON, FROM THE HOTEL CARNAVELET. W. T.

The lithograph reduced in scale about three-quarters, the drawing about one-half.

PLATE VI.—PEN-WORK FROM PHOTOGRAPH. GROTESQUE FROM THE NEW HOTEL DE VILLE.
The photograph reduced about two thirds, the drawing one-half.

But just as, when we take up free-hand work in preference to mechanical drawing, we nevertheless begin with a little work with the T-square and compasses, so as to establish a certain standard of accuracy, so here we find it best to let the students begin by trying their hand at the representation of rounded surfaces by graded tints. The real facts in regard to the gradations of shadow are thus brought to their notice, and their observation quickened, while their inevitable failure to reproduce the facts, and the unworkmanlike appearance of their work, convinces them, as nothing else would, that a more conventional method of treatment is more within the range of their powers and promises a more satisfactory result.

The skill and dexterity of hand required faithfully to represent these planes is only the skill to produce with the pen or pencil a flat tint of any depth, and this is of comparatively easy attainment. A few hours' practice in making straight parallel lines close together suffices to meet all the demands which a beginner's knowledge makes upon his skill. Stippling, cross-hatching, or the making of graded tints with shaded lines, straight or curved, such as are to be observed in the lithographs furnished as examples for crayon drawing in schools, had best be deferred to a later period. They divert attention from the appearances to be represented to tricks and devices of representation. (Plate V.)

There is moreover something of the same advantage to be found in the employment of only a single kind of stroke in shading, that there is keeping to a single medium, such as the pencil, or, in music, in studying only one instrument at a time. It limits the possibilities of expression, indeed, but by concentrating effort within a narrow compass gives prompt mastery over all the possibilities within reach. In so doing it not only secures a certain unity of effect, characteristic of the system chosen, but, what is more important, by altogether eliminating the question of the means to be employed, it prevents attention from being wasted in considering which means is likely to be the most effective. The choosing of instruments is, in any art, a task beyond the range of beginners. (Plate VI.)

The treatment in question is so simple that surprisingly good results are reached, almost from the first. It is the special merit of this system that with care and attention even unskilful hands can produce fairly presentable drawings. What is needed by the draughtsman, however, is hands so skilful that they will do good work almost automatically, that is to say will make a line neat and clean, while his attention is mainly devoted to its shape and size. But this masterly touch comes only by much more practice than two or three hours a week afford. This practice our men obtain in the preparation of daily sketches. Each member of the two younger classes hands in every week five pencil sketches, carrying about with him a little pad of smooth paper for the purpose. Sketches of objects or drawings from mem-

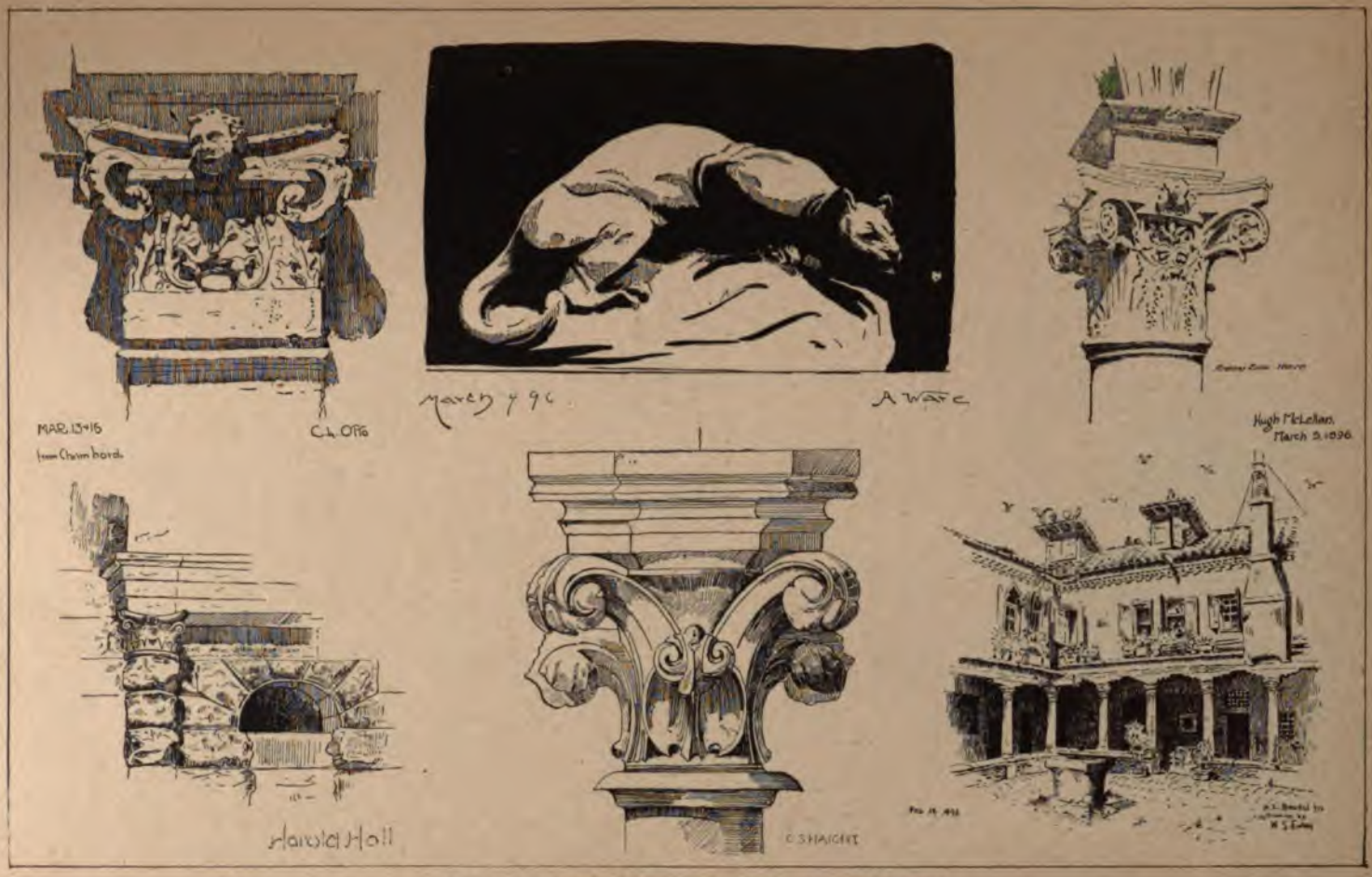


PLATE XIII.—EVERY-DAY SKETCHES. (Second Year.)

ory are sometimes prescribed, but for the most part they illustrate current work—projections, shades and shadows, the orders, etc.—and thus serve a double purpose. They take from five to ten minutes to half an hour to do, time which otherwise have been wasted, and incidentally they tend to encourage the useful habit of occupying odd fragments of time to advantage. (Plate XIII.)

These simple manipulations, comprising the making of outlines, straight or curved, with a firm hand, and the making of flat tints of any required depth by parallel vertical shading, the lines of which are without individual significance, have other advantages besides that of being easy to learn. They are easily adjusted to the student's state of advancement and to the degree of completeness desired. They compel a careful study of form, since what is once done is done once for all, without expectation or intention of retouching, and they fix attention upon the main masses of form and of light and shade, the representation of unimportant details being impossible. Moreover the result, however incomplete, is good as far as it goes, and is sure to be clean and bright, not woolly or muddy, as the shaded drawings of beginners are apt to be. It is also eminently suited to the architect's convenience, employing the lead pencil, which is *par excellence* the architect's weapon, and dispensing with the cumbersome and untidy apparatus of charcoal, crayons, stumps and "sauce," a paraphernalia which requires a habitat of its own and is out of place among the books, photographs, and drawings among which an architect lives. *Prof. William R. Ware.*

[TO BE CONTINUED.]

THE NEW YORK PUBLIC LIBRARY
ASTOR, LENOX AND TILDEN FOUNDATIONS

VALUE OF DIFFERENT KINDS OF STONE PRODUCED IN 1894 AND 1895.

MARBLE—VALUE OF MARBLE PRODUCT BY STATES.

THE following table shows the value of the marble produced in the United Stares during the year 1895, by states:

Value of marble product for the year 1895, by States.

State.	Value.
California	$22,000
Georgia	689,229
Idaho	2,250
Iowa	13,750
Maryland	145,000
Massachusetts	2,000
New York	207,828
Pennsylvania	59,787
Tennessee	362,277
Vermont	1,321,598
Total	$2,825,719

The value of the output in 1894 was $3,199,585. A falling off of $373,866 is thus evident. Improvement in the industry was noticeable toward the latter part of the year, and many of the producers speak quite hopefully of still more decided improvement in 1896. A number of operators who were entirely inactive in 1895 contemplate a resumption of business in 1896. The chief cause of the decline in 1895 was, naturally, business depression, causing greater economy in the use of ornamental material of every kind. Another reason is one which is independent of hard times—namely, the increasing use of granite for cemetery purposes and for polished interior work in public buildings. Owing to the invention of new machinery for turning, polishing, and carving granite, and the use of improved abrasive material, this stone is coming more and more into general use and thus into competition to a certain extent with the softer and more easily finished marble. Prices for marble products have declined somewhat in a number of localities during the past two years.

The adoption of a number of the leading marbles of the United States in the new Congressional Library Building in Washington furnishes a fine opportunity for the comparative study of these materials as well as of a number of varieties of Italian marble. Probably no other building in the world shows so well the beauties and fine effects obtainable in marble, whether in polished slabs or carved or otherwise finished, as does this magnificent structure.

The following table shows the value, by states, of the marble produced during the years 1890 to 1895, inclusive:

Value of marble, by States, from 1890 to 1895.

State.	1890.	1891.	1892.
California	$87,030	$100,000	$115,000
Georgia	196,250	275,000	280,000
Idaho	.....	.....	.....
Iowa	.....	.....	.....
Maryland	139,816	100,000	105,000
Massachusetts	.....	.....	100,000
New York	354,197	390,000	380,900
Pennsylvania	.....	45,000	50,000
Tennessee	419,467	400,000	350,000
Vermont	2,169,560	2,200,000	2,275,000
Scattering	121,850	100,000	50,000
Total	$3,488,170	$3,610,000	$3,705,000

State.	1893.	1894.	1895.
California	$10,000	$13,420	$22,000
Georgia	261,666	724,385	689,229
Idaho	4,500	3,000	2,250
Iowa	.....	.....	13,750
Maryland	130,000	175,000	145,000
Massachusetts	.....	.....	2,000
New York	206,926	501,585	207,828
Pennsylvania	27,000	50,000	59,787
Tennessee	150,000	231,796	362,277
Vermont	1,621,000	1,500,399	1,321,598
Total	$2,411,092	$3,199,585	$2,825,719

THE MARBLE INDUSTRY IN THE VARIOUS STATES.

California.—Marble quarrying in California was very much restricted during 1895, and producers, without exception, have expressed themselves in the most unqualified manner to the effect that there was scarcely any inducement to continue quarrying during the year. Operators are awaiting such a revival in business as will justify them in renewing their efforts. Under ordinarily good conditions of trade the State is equal to a production of marble valued at $100,000 per annum, but, as is evident from the table of production, the figure for 1895 is far below this limit.

Idaho.—A small amount of marble was produced in Cassia county during 1895. Larger amounts would doubtless be quarried if business were in a normal condition. Quarries are at present being opened near Albion, Cassia county, and an output may be looked for from these in 1896.

Georgia.—The activity of marble quarrying in Georgia during the past two years is almost phenomenal, when the depressing conditions of trade generally are considered. The product for 1895 was valued at $689,229, which falls but little below the corresponding figure for 1894. A most commendable spirit of business enterprise has been shown in the development of these quarries since the year 1884. The stone is now well and favorably known throughout the country for interior decoration as well as for outside

construction and cemetery work. Improvement in demands was noticed toward the latter part of the year, and for building, both exterior and interior, the outlook for 1896 is good, much better, in fact, than for ornamental and cemetery products.

Iowa.—Marble production in Iowa is of recent date, but, as the material appears to withstand exposure very well, there is no reason why it should not develop into a permanent industry. The stone is not what would be called highly crystalline, and some of it is not, in the strict sense of the term, true marble; it is really a coralline limestone in various stages of metamorphism, some of it being crystalline. In the form of mantels and other kinds of interior decoration it gives very pleasing effects, some of the coral markings being very delicate and beautiful. As is evident from the table of production, but little has as yet been accomplished in the way of actual output.

Maryland.—The Maryland marble quarries, like those in a number of other states, have produced less stone in 1895 than in the preceding year, but, with the improvement in general trade, activity in quarrying will doubtless increase. The Maryland marble is so thoroughly well known for its desirable qualities that, while production fluctuates a little according to changes in commercial activity, it is as little affected by financial depression as any similar stone in the country.

Massachusetts.—Marble from quarries at Lee, in this state, has long been quarried, but at present but little is being produced.

New York.—In 1894 the value of the marble output was much higher than usual. This was due to greatly increased activity at Tuckahoe. The figure for 1895, namely, $207,828, is somewhat below the customary output, but the restricted production is entirely due to the depression in business, which caused a number of quarries to suspend operations for the year. Some of them resumed production early in 1896, and the quarrymen regard indications for 1896 as much better than for two years past.

Pennsylvania.—Quarries in Montgomery and Chester counties produce an annual output of about $65,000 value. The Montgomery county stone has been known to the trade for a long time, and for building purposes it has a well-established reputation. The Chester county stone is of comparatively recent discovery, but it is rapidly making a reputation for its adaptability for building purposes, for which most of it is used.

Tennessee.—During the past year quite a significant advance has been made in the marble industry of this state. In spite of financial depression the value of the output has increased from $231,796 in 1894 to $362,277 in 1895. The chief use to which Tennessee marble has been put in the past is interior decoration, although at the period when marble-topped furniture was fashionable large quantities were devoted to this use. At present the

stone is strongly advocated by the producers as an outside building material; judging from its appearance in a number of buildings in which it has been used it will probably make a reputation in this line. Improvements in quarrying methods are being made, and it will be a matter of surprise if the industry does not show a remarkable advance within the next few years.

Vermont.—About one-half of the marble output of this country comes from Vermont. In 1892 the value of the output was $2,275,000, probably the highest figure which the industry has ever reached in any one year. Since that time there has been a decline, caused entirely by the general dullness of business. The output for 1895 is valued at $1,321,598. Indications for 1896 are for better business than for several years past. A few firms who have almost entirely suspended operations during 1895 expect to resume in 1896. *Wm. C. Day.*

[TO BE CONTINUED.]

MARBLE IN INTERIOR WORK.

WHAT we have to consider primarily is strength of material for its purpose; secondly, its adaptability; thirdly, and generally to the client the most important, its appearance when finished. If I followed my own inclinations, I should give marble the premier place as an internal material. Doubtless a number would say that marble is out of the question for general purposes, its cost is so great; but the marble does not itself ask for treatment such as you give to stone. Work executed in marble can and should be finished so as not to have any appearance of grimness or even of dinginess.

Marble should not be looked upon as a constructional, but rather as a decorative material; and, looking at its use from a monetary point of view, I would quote Mr. W. Brindley's paper before the Royal Institute of British Architects some two or three years back, where he tells us that "at St. Sophia 2,000 feet super of delightful decoration of a durable character was cut out of a single block of Cipollina marble, the whole opened out and making a continuous pattern." To adapt marble to concave or convex surfaces, I would ask you to follow out the scheme of the Byzantines, viz., forming the convex face of the apse with a series of narrow slabs opened out chevron fashion, thus producing a curtain-like appearance, which has a very pleasing effect. To save such work as this—in fact, all slab work—from having the appearance we find in some churches, several things have to be considered. For instance, if the walls are built of mortar, the sand of which is Thames sand, so-called; but if that sand comes from the mouth of the Thames, that constitutes sea sand. Consequently, you will get that dampness and efflorescence that is usual with that kind of mortar; the walls being

"cased" with marble, the salt naturally finds its way through. Marble should never be fixed solidly to the wall, but left hollow, and also with a joint here and there left open to allow for the condensation that invariably takes place. The work should be well cramped to the wall with copper cramps. The best of plaster should be used in fixing, and I have no hesitation in saying that if slab work is fixed under these conditions, and with a care in selecting suitable marbles, you will get satisfactory work. Then, again, as to keeping the work clean after it is fixed. All that is required is proper attention with dry dusters. Marble work should never be washed down as you wash tiles. The dust that clings to anything damp, if rubbed constantly on the polished surface, is literally ground into the face of the marble. This applies more especially to the light marble. But if a perfectly dry dusting is given to your work I venture to say that the result will be satisfactory.

The mason is a methodical man. If he works a moulding—say a cornice, for instance, or a string mould—he would proceed by applying his section to chamfers, and then working his chamfers through. Now, in designing your moulding, this should be taken into consideration, as moulding drawn to suit the method of working seems to me to be only right.

Work drawn on these lines, especially in marble, lessens the cost of labor considerably, the mason being able to get at it much better than if at the outset you upset his method of working. You will also observe that marble moulding drawn on these lines can be got out of these slabs and made out with a core of stone, thus giving you in effect solid cornices, etc. In drawing your sections for marble it is very essential that you should have a knowledge of the material, and its capabilities of receiving mouldings. The composition of the various kinds varies to such an extent that a moulding that could be worked in one marble would be quite out of the question in another. For instance, take a chimney-piece in statuary or Pavonazza, and then one in the Cipollina or Rouge Etrusque. What could be produced in the former materials would be quite out of the question in the latter. Speaking generally, the rich colored marbles do not ask for an elaborate treatment in the way of mouldings; in fact, the different colors, lines, and markings of the material are very apt to upset the arrangement of mouldings unless they are treated in a broad manner. The use of marble by the architects during this revival, may I call it, has been very great, and I believe will be greater in the future, when its adaptabilities are more widely and better known.—*From a lecture by Mr. Harvey Flint, England.*

CENTRAL MARYLAND GRANITES.—III.

NOWHERE among the Maryland granites is the phenomenon of jointing better shown than in the Waltersville quarry of the Woodstock area. The horizontal divisional planes are particularly prominent, and at first glance give the impression of true stratification. These principal joints extend for considerable distances. They are crossed by numerous inclined and vertical planes of natural cleavage, which are usually much less prominent than the major lines just alluded to.

As to the origin of the joints, it seems probable that they are due to two causes—in part to the contraction of the granite during its original cooling, in part to subjection to severe torsion. The latter force is in all probability in action at the present time; for, as already stated, it would seem that, according to McGee,* crustal movement is now in active operation in the Piedmont region. The optical disturbances of the granitic quartzes of the district may also be due in some degree to the same cause, and the very marked rifting also points to the same conclusion. That systematic jointing may actually arise from strains of this kind has been satisfactorily proven experimentally by Daubrée,† and seems to find full confirmation in other extensive trials, as well as in the field.

WEATHERING.

In approaching the middle one of three quarries in the Woodstock district, fine illustrations of the weathering of granite are encountered. The quarry ledge has the appearance of a great wall of cyclopean masonry, layer upon layer of huge blocks rising one upon another with the regularity and precision of human workmanship. The separate blocks are more or less oblong in shape and often measure fifteen to twenty feet in length and from two to eight feet in height. They are all more or less rounded, the spaces between the different bowlders being filled with incoherent granitic sand, derived from the decomposed edges and the sides of the blocks. It is quite evident that the granitic mass was originally everywhere jointed, and that atmospheric decay took place much faster on the edges and corners than on the flat sides of the great fragments, thus quickly rounding them and forming them into bowlders like those found throughout drift areas. The sandy matrix is usually from five to ten inches in thickness. The interior of the

*Seventh Ann. Rept. U. S. Geological Survey, p. 619, 1889.
†Etudes syn. de géol. exper., p. 300, 1879.

bowlders is perfectly fresh, and affords the best of rock for building purposes. As decomposition progresses the amount of interstitial sand greatly increases, and the blocks become proportionately smaller.

The extreme difficulty with which the Woodstock granite yields to the attacks of frost, moisture, and other meteoric influences indicates that the rock is well adapted to resist disintegration through the usual exposure to the weather. Under ordinary circumstances chemical changes are but slight, and the cohesion of the components is sufficiently great to make this stone perhaps the most durable of any in the state.

SYKESVILLE AREA.

The granitic area of Sykesville is the most westerly of the acid eruptives within the limits of the Piedmont zone in Maryland. At the same time it is one of the largest single masses of granite exposed in the crystalline belt of the central part of the state. It is irregularly circular in outline, with apparently several broad prolongations running to the southward. Traversing the area in a west-to-east direction is the Patapsco river, flowing rapidly down its rock-cut channel; while near the center of the mass and overlooking the river is the little village from which the granite takes its name. A casual observation of the exposed, weathered surfaces of the rock might easily lead to the mistake of supposing it in many places to be gneiss. But, although considerably squeezed, it still retains its undoubted granitic character at depths beyond the immediate influences of subaerial decay. The natural outcrops of the rock are numerous along the smaller tributaries of the chief watercourse. The freshest examples of these are found at the schoolhouse, four miles directly south of Sykesville. The best exposure in the district, however, is beside the railroad, a few hundred rods below the station, where a quarry has been recently opened for paving blocks. During the progress of the work large numbers of inclusions of foreign rocks were brought to light in the granite, furnishing a good proof of its eruptive origin. These inclusions consist of irregular fragments of all sizes and shapes. Among the various fragments noted may be mentioned those which were originally limestone, soapstone, pyroxenite, vein-quartz, hornblendic and biotitic gneisses. Both with the naked eye and in thin slices under the microscope contact phenomena are seen similar in all respects to those which characterize the action of intrusive igneous rocks on calcareous or argillaceous sediments through which they have broken or which they inclose.

The inclusions derived from the limestone appear as thin, yellow slabs, from one to several centimeters in thickness and of various sizes. One of these in particular requires special notice. It is a very thin plate, perhaps a foot across, which has been twisted and bent into a most fantastical shape. It may originally have been flat, and became twisted after being inclosed in the liquid magma, or it may have been a fragment of the rock puckered

considerably before being broken away from the main deposit. Four distinct zones are readily recognized microscopically in the inclusions of this class: (1) The median portion, which is fine-grained and lemon-yellow in color. It is surrounded by (2) a narrow band, usually two to three mm. in thickness, white in color, and apparently composed chiefly of minute grains of quartz. Then comes (3) a very fine-grained, dark-colored shell of varying thickness, containing abundant small garnets, up to one mm. in diameter. In many cases this layer is so thin as to be scarcely noticeable. It shades off rather abruptly into (4) the typical granite of the area.

Microscopically the four zones are even better differentiated.

1. The yellowish, central part is made up almost entirely of very fine grains of epidote and quartz, in the proportion of about two to one, a little chlorite also being present. In some sections considerable hornblende is developed. A chemical analysis of this lime-silicate-hornstone was made by Mr. W. F. Hillebrand as follows:

SiO_2	67.02	K_2O	.09
Al_2O_3	13.77	Na_2O	.66
Fe_2O_3	4.64	H_2O	1.16
FeO	1.09		
CaO	11.09	Total	100.10
MgO	.65		

2. The narrow white band is found to consist almost wholly of fine, allotriomorphic quartz, though a few large grains are noticed. Epidote in minute elongated crystals and in small, irregular, rounded grains is sparingly distributed through the layer; also, occasionally little specks of biotite and very minute particles of magnetite. The boundaries of this zone are both sharply defined.

The fine-grained dark zone, though apparently not well represented in some cases, has a thickness of more than fifty mm. in some parts of the S-shaped mass just alluded to. The quartz is very fine and makes up the greater portion of the mixture. Garnets in small, sharply defined dodecahedrons are numerous. Only small quantities of magnetite are observable. The epidote is abundant, in small elongated crystals preserving some of the crystallographic boundaries, but seldom the terminal planes. The irregular grains so common in the lime-silicate-hornstone area are rarely met with here. In the larger S-shaped mass this soon becomes feldspathic toward the exterior, though the orthoclase and plagioclase are greatly decomposed and muscovite is abundantly developed. The garnets are also much larger, often attaining a measurement of more than a millimeter.

The chemical composition, according to an analysis by Mr. W. F. Hillebrand, is:

SiO_2	47.35	K_2O	6.83
Al_2O_3	29.76	Na_2O	2.84
Fe_2O_3	2.94	Li_2O	Trace.
FeO	3.15	H_2O	3.15
CaO	2.20		
MgO	1.60	Total	99.82

In some of the inclusions small tourmalines are quite common in this zone.

The soapstone inclusions show little or no traces of contact metamorphism. Rhombohedrons and irregular grains of siderite abound in the talcose fragments. These fragments are identical in all observable characters with soapstone containing siderite, which occurs abundantly at Mineral Hill, seven miles northeast of Sykesville, and which belongs to the long belt of this rock extending many miles across this region. This belt passes a short distance to the eastward of Sykesville.

Biotitic and hornblendic gneiss fragments are abundantly distributed through the granite. The margins are usually changed considerably for a distance of about one cm. The interior of the gneiss pieces is practically unmetamorphosed. It is much lighter in color than the contact border. The constituents have undergone much crushing, and the feldspars are scarcely recognizable. The biotite is nearly all bleached, and chlorite is very abundant. Considerable secondary epidote and muscovite and a few large decomposed cubes of pyrite are also present.

The margins of the gneiss blocks are dark-colored and much finer in grain. No traces of pressure are observable, and apparently complete recrystallization has taken place. Biotite is very abundant in small flakes oriented in the direction of foliation. A little plagioclase and orthoclase and small quantities of pyrite occur.

A number of small, greenish fragments are seen under the microscope to be composed of biotite, chlorite, and hornblende, with some quartz. They appear to have been originally derived from the pyroxenite belt associated with the soapstone zone just alluded to.

Large inclusions of vein-quartz are also met with.

In the present connection it may be well to state that inclusions and phenomena similar to those observed in the Sykesville area have been described recently by H. Credner.*

WEATHERING.

On the whole, weathering effects of the Sykesville granite present some striking contrasts with those of the Woodstock area, and are much more complete. Decomposition extends from the surface downward for thirty feet or more in places. The decayed portion preserves all the appearances of the granite itself, but under the touch it falls readily into sand. This loose arenaceous material is without bowlders or pebbles, is easily excavated to a depth of many feet, and when suitably exposed to the action of running water is carried away, as a sand bank along some watercourse melts into the flowing stream.

*Erläuterungen zur geologischen Specialkarte des Königreichs Sachsen, Section Pillnitz, p. 17, 1892.

The absence of glacial action in Maryland has left many phases of rock decay not usually met with in the crystalline districts to the northward. In those areas where ice has acted vigorously in great masses the rocky surfaces are often smooth and hard, with little or no traces of internal disintegration. South of the terminal margin of the last great ice-sheet, as in the State just mentioned, it is not uncommon to find in granitic and gneissic areas the rocks broken down for many feet below the surface, the debris still remaining in situ. As has been shown by Russell,* the depth to which this kind of rock decay takes place appears to increase rapidly with distance southward from the glaciated region.

A dozen miles south of Sykesville and a few miles north of Sandy Spring, granitic rocks are exposed along the Big Patuxent and its tributaries. In its general character this rock appears to be essentially like the Sykesville granite. It was thought at one time that the area formed the southern extension of the Sykesville district, but the two masses are now known to be separated by a considerable interval occupied by the Piedmont gneiss.

Charles Rollin Keyes.

*Bull. U. S. Geol. Survey No. 52, 1889.

[TO BE CONTINUED.]

PORTLAND CEMENT FOR ANCHORING BOLTS IN STONE.

SEVERAL years ago a number of experiments were made to determine the value of Portland cement for anchoring bolts in stone, and the results are worth recalling now because of their great interest to engineers in such work as fixing holding-down bolts for engine beds, gas-holder framing, and the like. It appears that certain gantry-work for an elevated railway had to be constructed upon rock so near the surface as to necessitate anchoring the foundation bolts, and as some more durable and cheaper way of doing this than by the use of sulphur or lead was desired, Portland cement was suggested and tried. No records exhibiting the adhesive strength of cement in pounds per square inch could be discovered; hence it was decided to investigate the matter specially. For this purpose fourteen holes were drilled in a ledge of solid limestone, one-half of them being 1⅜ inches and the others 1⅝ inches in diameter, and all 3½ feet deep. Seven ¾-inch and seven 1-inch bolts were prepared, with thread and nut at one end, and jagged at the other for a length of 3 feet 6 inches. There were no heads to these bolts; nor were they swelled. Four of them were anchored with sulphur, four with lead, and six with neat cement, both sizes of the bolts being used equally. All were allowed to stand for a fortnight after setting, when a lever of sufficient power was rigged, and they were pulled.

In sulphur three bolts out of four developed their full strength of 16,000

pounds and 31,000 pounds respectively. One 1-inch bolt failed by drawing out under a strain of 12,000 pounds. In lead also three out of four bolts developed their full strength as above; but one 1-inch bolt drew out under a pull of 13,000 pounds. In the cement five bolts out of six were broken without drawing out. One 1-inch bolt began to yield in the setting at 26,000 pounds; but it sustained the full load for a few seconds before it broke. While this experiment demonstrated the inferiority of cement both as to strength and ease of application, it did not give the holding strength per square inch of area. To determine this, limestone blocks twelve inches thick were prepared, with holes for bolts drilled clean through them. Holes 1¾ inches in diameter were prepared for 1-inch bolts, and 2¾-inch holes for 2-inch bolts. Some bolts were cemented into these holes plain and smooth, while others had screw-threads cut upon them. The specimens were allowed to stand for thirteen days, and they were then pulled in a standard testing machine. The smooth 1-inch bolt began to yield at 20,000 pounds, and the threaded one at 21,000 pounds, The 2-inch smooth bolt began to give at 34,000 pounds, and the threaded one at 32,000 pounds. In these tests the pressure was applied very gradually. When the pump was run at a greater speed to represent a more sudden strain coming upon the bolts, the stones split before the bolts yielded. It was thus ascertained that the English Portland cement used was more reliable, stronger, and easier of application than either lead or sulphur for the purpose; and that its resistance as a setting for holding-down bolts is from 400 to 500 pounds per square inch of surface in actual contact. Moreover, not much appears to be gained in a long bolt by jagging or threading the embedded shank.—*The Quarry, London.*

"STONE is a most interesting book to me, and I read it more eagerly than any magazine that we have, and we take eight or nine."—*Mrs. Jonas H. French, Boston, Mass*

GEOLOGY FOR QUARRYMEN.*

ORIGIN OF JOINTS.

VARIOUS causes have been assigned for joints, of which the more important are tension, torsion, earthquake shocks, and shearing. It is believed that joints may be classified into *tension joints* and *compression joints.* The first are ordinarily in the normal planes, the second are in the shearing planes.

Tension joints.—Tension is often due to the contraction caused by cooling or by desiccation. It is well known that the peculiar columnar jointing of igneous rocks is due to contraction and consequent tension caused by cooling, and the mud cracks of sedimentary rocks are due to the contraction and consequent tension caused by desiccation. However, it is probable that neither cooling nor desiccation is important in the production of systematic sets of joints in the sedimentary rocks.

When rocks are simply folded and not too deeply buried the convex halves of the anticlines and synclines are subjected to simple tension (fig. 102). If the tension goes beyond the limit of elasticity, radial cracks will be formed which strike parallel with the rocks. Joints of this class are at right angles to the tensile force. If the folded rock has planes of weakness of any kind, due either to a primary or a secondary structure, the fracture due to the tensile stress may be controlled by these, and thus deviate from the normal planes.

Joints produced by tensile stress may have smooth or rough surfaces, depending upon the character and strength of the rock. If it is a weakly cemented sandstone, the fracture is around the grains. If, however, it is a strong, tolerably homogeneous graywacke, quartzite, or limestone, or similar rock, the fractures may be clear-cut and sharp. After joints due to tensile stress have formed, subsequent movements may press the surfaces together, or may fault the strata in a minor or major way, and thus produce slickensided surfaces.

Folds, instead of being simple, and, therefore, in a horizontal attitude, usually have a pitch; or, in other words, the rocks are folded in a complex manner. In such regions there may be tensile stresses in two directions at right angles to each other, thus producing two intersecting sets of joints. One of these sets, that roughly parallel to the more conspicuous folds, would be called strike joints, while the other set of joints, parallel to the transverse

*Reprinted from Sixteenth Annual Report U. S. Geological Survey.

folding, would be called dip joints. Both sets would intersect the bedding nearly at right angles. The fact that two sets of joints in these positions so frequently accord in direction with the strike and dip is strong evidence that many joints are produced by the tensile stress of folding on the stretched half of the mass folded. If the folds are nearly horizontal—that is, if the force were mainly in a single direction—the strike joints may be strongly developed and few dip joints produced. If, on the other hand, the folds are important in both directions, the strike and dip joints will both be important.

Daubrée has shown that if a brittle plate fractures when it is subjected to torsion beyond the limit of elasticity, a double set of parallel fractures nearly at right angles to each other are produced.* The forces which produce complex folding deform the strata, where not too deeply buried, in two rectangular directions by tensile stress; or, in other words, they are subject to torsion. It therefore appears that Daubrée's explanation of joints

FIG. 102.—IDEAL SECTION OF BENT ROCK STRATUM SHOWING THE FRACTURING ALONG CONVEX SURFACE AND COMPRESSION ALONG CONCAVE SURFACE.

by torsion is but another statement of the production of joints by complex folding normal to the two principal directions of tensile stress.

A question for investigation is the extent of the area over which joints and faults run in rectangular directions. In the case of a large and strongly pitching fold, the force of torsion may produce rupture in different directions upon different parts of the folds. Upon the flank of the pitching fold, at a proper point, strike joints and dip joints may be formed, striking halfway between the ordinary strike joints and faults, and dip joints and faults at the crests and troughs, and between the two there would be all gradations.

Crosby has recently suggested† that when torsion has nearly, but not quite, reached the limit of elasticity in rocks, an earthquake shock may act as the trigger which sets the process in motion, and he thus combines this

*Géologie expérimentale, par A. Daubrée, pp. 306-314, Paris, 1879.

†The origin of parallel and intersecting joints. W. O. Crosby, Am. Geol., Vol. XII, 1893, pp. 368-375.

cause with torsion in explaining joints. Crosby also emphasized the fact that a plate when subjected to torsion does not crack along a single plane of fracture, the weakest plane, but that many parallel fractures are produced. He applies this fact to rock beds, and suggests that the fracture must first occur at some one plane, that of the greatest stress or least strength in the distorted belt. The shock of the fracture, added to the force of torsion, goes beyond the ultimate strength of the beds at the next weakest plane, thus fracturing them and producing another joint, and so on, until complicated fracturing actually obtained in the glass plate is paralleled by the rocks. He thus makes the rupture of the first joint itself serve the purpose of a secondary shock, and this rupture a third shock, and so on, producing a set of joints in rapid succession over an extended area. Finally a place is reached where the rock has not been sufficiently distorted for the shock of the last fracture to carry the stress beyond the breaking strength. This theory is as applicable to simple tension as to torsion. In the above it appears that Crosby has overlooked the fact that he has not explained the first earthquake shock. The statement might be amended as follows: The first fracture occurs because the steadily acting orogenic forces finally go beyond the ultimate strength of the deformed beds. When rupture takes place, this gives the first shock. This initial shock carries the stress beyond the ultimate strength of the next weakest planes, and so on.

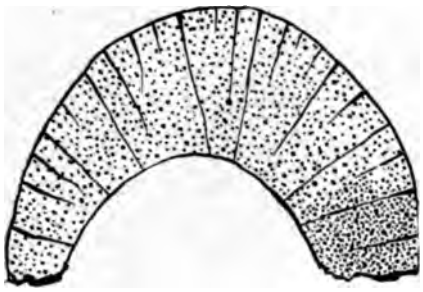


FIG. 130.—RADIAL CRACKS DUE TO TENSION IN SHARPLY FLEXED STRATUM.

Compression joints.—Daubrée and Becker* shows that joints may be produced by compression. In this case there will be jointing in two planes when the rocks are simply folded, and, according to Becker, there may be jointing in three or four planes when they are complexly folded, one of these being normal to tensile stress and the others in shearing planes. However, where there are more than two sets of joints at right angles to each other, it is probable that in many cases these have been caused by successive orogenic movements, the second being in a different direction from the first. Becker has explained that minor faulting is a common phenomenon of compression joints.

When the folding is simple, both sets of joints developing in the shearing planes, although dipping in different directions, would accord in their out-

*George F. Becker: Finite homogeneous strain, flow, and rupture of rocks. Bull. Geol. Soc. Am., Vol. IV, pp. 41-75, 1893. The torsional theory of joints. Trans. Am. Inst. Min. Engineers, Vol. XXIV, pp. 130-138, 1894.

crop with strike, and might therefore be regarded as strike joints. When the folding is complex it may be that different sets of shearing planes would correspond to strike joints and dip joints, but upon this point further observation is needed.

In the Knox dolomite of East Tennessee the formation of joints along both tensile and shearing planes is beautifully illustrated at numerous localities. Commonly the joints produced by tensile forces are nearly perpendicular to the bedding. Two sets of joints, equally inclined to the bedding and making obtuse angles with each other, are clearly in the shearing planes.

The attitudes of joints produced by shearing and their relations to bedding would be identical with fissility. Whether the structure be called fissility or joints would depend upon their number. If numerous and close together the structure would be called fissility; if fewer and farther apart, jointing. The same compression might produce fissility along one set of shearing planes, and joints along another. If the above be true, it is clear that there are all gradations between joints and fissility. It has been suggested that the term "fissility" might perhaps be wisely restricted to the cases were the structure is secondary to a previous one, such as cleavage or bedding, and that the term "joint" should be used to cover fractures along independent shearing planes.

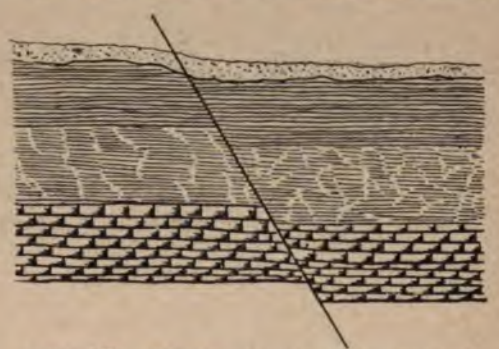


FIG. 137.—NORMAL OR GRAVITY FAULT.

In thus explaining many joints as the result of the same forces which produce folds, it is not meant to imply that there are not joints of other origin, but merely that the master joints, which run in different directions approximately parallel to the strike and dip, may be thus explained, and these are the points which are the most useful in determining the structural relations of different series.

ZONE AFFECTED BY JOINTS.

Joints, implying as they do openings in the rocks, are necessarily confined to the outer zone of fracture and the middle zone of fracture and flowage. In the first zone they are of more importance and probably more regular than in the second. In the deeper zone of rock welding no joints can develop. In rocks once buried to this depth, which subsequently reached the surface by erosion, joints may be formed; for in approaching the surface

they passed from the zone of flowage, through the zone of fracture and flowage, into the zone of fracture.

RELATIONS OF JOINTS TO STRATIGRAPHY.

If there is a greater number of sets of joints in an inferior formation or formations than in a superior formation or formations, the two divisions being of such lithological character as to be equally likely to take on jointing, this argues that there may be discordance between the two sets, for it is probable that the lower set of formations, which has the more complicated jointing, was subjected to orogenic movements which produce a part of these fractures before the upper series was deposited. Comstock has applied this as the determining criterion in separating three supposed series of rocks in the Llano district of Texas. The lower series of formations is said to have three sets of pronounced joints running in definite directions, while the middle series has only two sets of joints running in definite directions, these

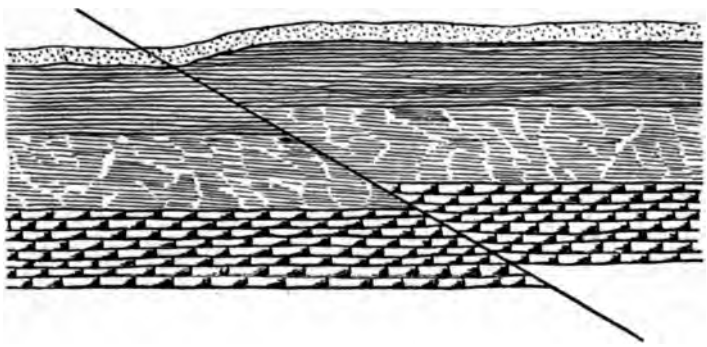


FIG. 138.—REVERSE OR THRUST FAULT.

two being common with two of the three in the lower series, and the upper series has a single set of joints running in a definite direction, this system being common to both the inferior series. Comstock's inference is that the system of joints in the lowest series not found in the upper two series was produced before the upper two series were deposited, and that the two sets of joints found in the lower series, one of them also affecting the middle series and both absent in the upper series, were present before the latter series was deposited. That is, the lower series was subjected to three orogenic movements, the middle series to two, and the upper series to one. Considering that two or more sets of joints may be developed by a single orogenic movement, it would seem that such a conclusion should be supported by other criteria.

ORIGIN OF FAULTS.

Faults differ from other rock fractures, in that there is important dislocation along the fractures, and often also they are far more extensive. Like joints, faults may be classified into *tension faults* and *compression faults*,

the first forming in the normal planes and the second in the shearing planes. Faults are, however, usually defined as normal and reverse. A *normal fault* is one in which the overhanging side descends in reference to the other, while in the reverse fault the overhanging side ascends in reference to the other. Another term applied to reverse faults is *thrust faults*, implying that tangential thrust is the controlling factor. As equivalent to normal fault may be placed the *gravity fault*, implying that gravity is the predominant force.

In the case of the normal fault the overhanging side has a smaller base than the other. Consequently, by force of gravity it descends, as compared with the other side. In all cases, both of normal and reverse faults, gravity is a never-ceasing force. As first explained by Le Conte,* the principle of the inclined plane thus applies to these two forces, the hade of the fault giving the inclination of the plane. Where the hade is greater than 45°, if the forces of gravity and tangential thrust are equal the fault is normal, because gravity controls the movement (fig. 137). If, on the other hand, the hade is less than 45°, tangential thrust is the predominant force, and the fault is a reverse one (fig. 138). As the hade becomes steep, gravity has greater and greater relative power, and if the hade is very steep, gravity may be able to overcome the tangential thrust, even if the latter is several times as great as the former. So, also, if the hade is flat, tangential thrust even much weaker than gravity may overcome it and produce a reverse fault. This is one reason why, as a rule, normal or gravity faults have steep hades, while reverse or tangential faults have flat hades.

There is, however, another reason. Since tension faults form in the normal planes, they are usually steeply inclined or nearly vertical. But the very idea of tension faults implies that there is no thrust. Hence, gravity has its full effect, and the overhanging side goes down with reference to the other side. It does not follow, therefore, that all gravity faults are tension faults, although this may be the case. Compression faults form in the shearing planes, and they are therefore likely to be much inclined to the vertical. In order that rupture shall occur the thrust must be great, and hence compression faults are usually, and perhaps always, thrust faults.

Perhaps it would be well to classify faults as gravity faults and thrust faults, rather than normal and reverse faults, and thus give them names which refer them to the predominant causes. For the present this classification is preferable to the classification tension faults and compression faults; for it is possible, through hardly probable, that an inclined fracture may result from compression, and after a time thrust lessen in amount, so that gravity controls the final differential movement.

*On the origin of normal faults, and of the structure of the Basin region. Joseph Le Conte. Am. Jour. Sci. (3), Vol. XXXVIII, pp. 257-263.

RELATIONS OF FAULTS TO EXPANSION AND CONTRACTION.

Gravity faults result in the dilation of the part of the crust affected by them (fig. 137). Thrust faults result in the contraction of the part of the crust affected by them (fig. 138). In a region in which many parallel faults occur, all of the same character, the dilation or contraction may be a considerable percentage of the breadth of the area disturbed. Since the amount of dilation or contraction with a given vertical movement increases as the hades become flat, and since thrust faults have flatter hades on the average than gravity faults, the shortening of the crust in a region of thrust faults is usually greater than the elongation in another region in which gravity faults are about equally abundant and in which the vertical displacements are the same.

RELATIONS OF FAULTS TO STRIKE AND DIP.

While there is great variability in the direction of faults, due to exceptional causes, faults are more frequently parallel to the strikes and to the dips, other things being equal, than in other directions, so that faults are sometimes spoken of as strike faults and dip faults. Since a fault may be no more than a displaced joint, this relation is easily explained in the same manner as in the case of joints.

RELATIONS OF FOLDS TO THRUST FAULTS.

It has been long recognized that thrust faults are often related to overfolds. If the strata are in the zone of combined fracture and flowage, the overfolds may be broken along the reversed limbs and the arch limbs be thrust over the trough limbs. In a region of overfolds and thrust faults, if it could be determined whether the differential movements are such as to carry the material moved toward the surface or away from the surface, it could be decided whether such folds and faults should be called overthrusts or underthrusts. But the differential movements, the forms of inclined and overturned folds, and the character of the thrusts are identical, whether a given bed above be considered as moving forward and upward as compared with the layer below, or be considered as moving forward and downward as compared with the layer above. In fig. 139, if the force be considered as applied at A, it would be called an overthrust fault; if the force be considered as applied at B, it would be called an underthrust fault; and yet the phenomena are identical. The movements must be such that the material goes in the direction of relief, and it is probable that this is more often toward the surface of the earth rather than deeper within the earth. It is probable that in certain cases thrust has been transmitted by a strong formation or series and pushed under other strata. This is particularly likely to occur where the lower strata are weaker or where the material in advance of the active strata transmitting the force has been already raised into folds, and thus partly escapes the pressure.

As explained by Willis, in regions which are but lightly loaded the forces producing thrust faults may result in clean-cut fractures, with scarcely any bowing of the layers of the rocks along the shear planes (figs. 127 and 128). In passing to greater depths the load is greater, and the layers, instead of all having the full movements of the clean-cut thrust faults, adjacent to the fault planes may be found to be in sharp overfolds in opposite directions upon opposite sides of the faults (fig. 139). Where the load is still greater these folds are of increased importance. Under still greater load the rocks may be first bent into an overfold, with little faulting, and finally at a greater depth the deformation may occur altogether by overfolding. It is therefore clear that in the same mountain mass there may be all gradations between clean-cut thrust faults and overfolds without faults. The transition may be longitudinal, as in the case of the Appalachians, where thrust faults which occur in the extreme southeast are gradually replaced by overfolds to the northwest. Also the transition may be transverse. In the latter case, if erosion cuts the strata to different depths after such a region was deformed, the overfolds may be found in the central parts of the mountain mass, the transition phases upon the intermediate areas, and the thrust faults without overfolds upon the outer flanks of the mountains.

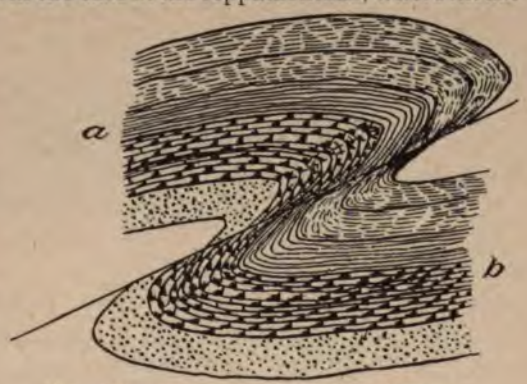
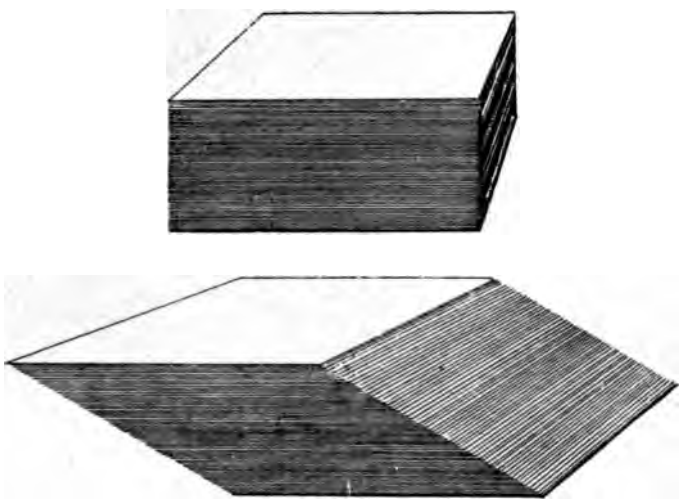


FIG. 139.—FOLD PASSING INTO FAULT.

Rocks at a certain depth, and therefore under a definite load, may be deformed first by folding and afterwards by faulting. Suppose a rock is deeply buried, but not so deeply as to cause the superincumbent load to equal its ultimate strength. Suppose the differential stress for a given stratum under these conditions to surpass the elastic limit, but not to reach the ultimate strength of the bed. It will then be deformed by folding, but during the process shearing occurs on the limbs, and as a result the bed is thinned, and finally the stress may surpass the ultimate strength of the rock, which will then be fractured and perhaps faulted. The same result may be reached if before a stratum or formation is thinned differential stress increases so as to go beyond the ultimate strength of the rock. It follows from this that deformation by folding followed by faulting is normal for a considerable zone, for when the mountain-making forces for a given region first begin their work, it is to be supposed that the differential stress is moderate. As the stress increases in amount so as to exceed the elastic

limit the layers would begin to be folded, and fracture would occur as soon as the differential stress reached the ultimate strength of a given layer, provided the rock was not in the deep-seated zone of flowage.

Accompanying thrust-faulting fissility may develop parallel to the faults and accompanying overfolding cleavage may develop which dips in the same direction as the axial planes of the folds. In an area intermediate between the zone of fracture and the zone of flowage, this being at successive times under the conditions of flowage and of fracture, there may be overfolding and cleavage combined with thrust and fissility. In passing from a faulted to a folded area, as has been noted, first there may be fissility along the thrust faults, then the strata may be slightly overfolded and tucked under along the faults, this undertucking becoming more and more prominent



FIGS. 127 AND 128.—THEORETICAL DEFORMATION OF LAMINATED ROCK BY UNIFORM DIFFERENTIAL MOVEMENTS PARALLEL TO A PREVIOUS STRUCTURE.

and fissility at the same time being replaced by cleavage, and finally we may have overfolds with cleavage, with or without faulting. Each of the different phases of the steps of change may occur on a large or small scale. In some places in an intermediate area a dozen little overfolds with fault slips may be seen upon a single hand specimen. Hence I conclude that the average deformation of a region may be the same whether it be by a few great faults with little or no fissility, by more frequent lesser faults with or without fissility, by faults and overfolds with or without both cleavage and fissility, or by folding with or without faults and cleavage; also that there is every gradation between faulting and fissility, and probably every gradation between faulting and cleavage.

ZONE AFFECTED BY FAULTS.

A fault may vary in magnitude from a fraction of an inch to many thousands of feet. A fault, like a joint, is limited in horizontal as well as vertical extent. It can not be assumed to extend very far beyond where observed. A fault of an inch may die out within a few inches, both laterally and vertically; a fault of a hundred feet, within a few hundred feet; a fault of five thousand feet, within a few miles. In following a fault longitudinally the throw may be found to become less and less until it is zero, just as a bunch of paper may be torn for a part of its length and the different parts of the torn ends be differently displaced. But while faults may thus die out within short distances, they may have remarkable persistence, both in direction and in length. This does not necessarily imply that they have great persistence in depth, for just as a fold has a tendency to die out, a fault may also die out below, and sometimes also above. In the latter case the fault usually occurs in a stratum or a formation which is brittle as compared with the overlying rocks. Because of the more plastic character of the higher strata the deformation there occurs by folding. Probably most faults at sufficient depth pass into flexures, and deeper down these flexures may die out. When a bed is deformed under little weight the strain necessarily causes fracture, and the readjustment is largely by faulting along the fractures. (fig. 96 and 97). When all the conditions are the same, except that there is such a load that as a whole the rocks are in the zone of flowage, the necessary deformation is accomplished by folding. In regions of close folds it is probable that before the superincumbent beds were removed by erosion many of the latter were faulted instead of folded, for they were in the zone of fracture and flowage, and in the zone of fracture rather than the zone of flowage.

Possibly the depth at which important faults disappear is in many cases not more than 5,000 meters although the discussion of the depth of earthquake shocks due to faults leads to the conclusion that some faults extend to the depth of a number of miles.

If there are inclined planes of weakness in the deep-seated zone of flowage, the deformation may largely occur by faulting along these planes.* Such inclined planes of weakness may be in sedimentary rocks or in igneous rocks. Since masses of intrusive rocks, either in the form of dikes or of bosses, usually have vertical or steeply inclined exteriors, faulting is particularly likely to occur at the contacts of igneous rocks with one another, or at the contacts of igneous with sedimentary rocks. It has already been explained that such deep-seated faults would differ in no way from the differential movements resulting in cleavage or fissility, except that the move-

*The Mechanics of Appalachian Structure, by Bailey Willis. Thirteenth Ann. Rept., U. S. Geol. Surv., pp.217-274. 1893. Especially Pls. XCV and XCVI.

ments are mainly confined to narrow zones. This results in great displacement at the fault zones and little displacement in the areas between the faults. In such supposed deep-seated faulting it is to be remembered that the displacement takes place without crevice or joint. At any given movement the rock is to be regarded as welded together. The different parts simply shear over one another along the plane of greatest weakness.

RELATIONS OF FAULTS TO STRATIGRAPHY.

Faults may be used to discriminate between series in precisely the same way as joints, and the criterion has far greater weight. If an inferior set of formations has a more complicated faulting than an upper series which lithologically is equally likely to be faulted, this is strong evidence that the

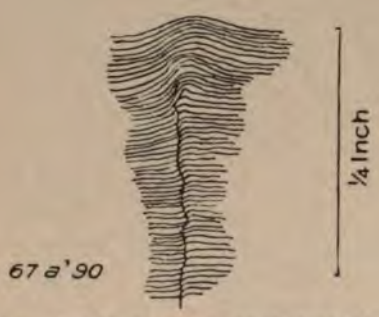


FIG. 96.—Microscopic section of phyllite (slate) made across the bedding from near North Stephentown, Rensselaer County, N. Y., showing a fold giving rise to a plane of slip cleavage.

FIG. 97.—Microscopic section of albitic sericite-schist made across the bedding from Mount Greylock, Mass., showing a fold giving rise to a plane of slip cleavage. Enlarged 80 diameters.

lower set of formations was faulted before the upper set of formations was deposited. Faults are frequently not easy to demonstrate or to trace out. Hence this criterion for discriminating between series is not so valuable upon the whole as are the more conspicuous and readily discovered phenomena of folds, cleavage, fissility, and joints, but if the conditions are favorable for tracing out the faults of a region, the information thus furnished may give positive evidence as to structural breaks between series.

GENERAL.

Horem folds, cleavage, fissility, joints and faults are regarded as the conjoint products of thrust and gravity. Similar forces acting upon heter-

that there are very tangible reasons for our belief in the worth and desirability of the burnt clay products as building material. Many of our readers will remember the architectural throes of the period immediately following the Centennial Exhibition, when the country was beginning to awake to the fact that we had no architecture, although possessing high creative possibilities. For a time everything was designed in the Gothic style. We had Eastlake chairs, Gothic store fronts, Gothic shingle palaces, and our designer seemed to feel that one style and one method of construction would answer every purpose. Fortunately, the years have brought a wider range of professional discretion, and the intelligent designer of to-day endeavors to adapt the style to the purpose of the building, and within certain vaguely defined limits to permit himself a latitude in the choice of architectural expression. Exactly the same latitude is expected in the choice of material. While we believe that the burnt clay products are the best and the most suitable for nearly all structural purposes, there are cases where nothing but stone can be used to the best advantage. There are other cases wherein iron or concrete is the proper material to use, and the fact that the burnt clay industries have increased to the extent we now find them is due very largely to discrimination on the part of our architects, and the attempt persistently repeated to use materials in a proper, consistent, and well-advised manner. Brick cannot do everything, and terra cotta does not fill every need. We can say this without the slightest derogation of its intrinsic as well as extrinsic advantages.

* * * * * * * * * * * * *

The points peculiarly in favor of brick and terra cotta as constructive materials are manifold. Brick is easily handled, requires little effort to put in place, can be readily repaired or altered, adapts itself to irregular contours, as well as to solid, massive construction, is absolutely fire-proof, and when properly made is impervious to the effects of the atmosphere. Terra cotta, more than any other material, receives directly the touch of the artist. It can be molded into any shape with the greatest ease; it retains all the individuality of the designer, and, like brick, can be set with ease in any position. On the other hand, if we look over the building stones which are now in the market, there are hardly more than two which, in point of mere durability, can compare with thoroughly burned terra cotta or brick. Only the best of the granites, and the Georgia marbles from the Tuckahoe quarries, can be entirely depended upon for all time. We know that sandstone disintegrates with time, and that limestone is affected by atmospheric acids, and no stone has yet been found which can be deemed to be safe against the action of extensive heat. This is recognized in some of the building laws of this country, which provide that wherever a stone pier is built below the

grade of the street, it must be protected by a casing of fire-proof material, preferably of brick.

* * * * * * * * * * * * *

The most rabid opponents of brick admit that the use of terra cotta, iron, and other materials in the construction of buildings has increased, while in many places the use of stone has been at a standstill. The recent developments of skeleton construction could not have been brought about except for the possibilities of brick and terra cotta. While stone is used a great deal in connection with the steel frames, every constructor and architect knows how difficult it is to make a thorough tie with stone about the structural members, and how doubtful the fire-proofing results are. On the other hand, brick fits into the webs and angles of the steel work, thoroughly protecting it, strengthening the whole by the cohesion of the parts, and at the same time permitting an amount of detail in design and decoration which, while it might be accomplished by the use of stone, would be much more expensive in the latter material and would certainly look no better. It must be remembered that the manufacture of thoroughly first-class terra cotta is comparatively a modern achievement, and that while stone has been used in the best manner for centuries, we have only lately learned how to preserve a high grade of constructive excellence with wide range of artistic possibilities in the burnt clay products; and the fact that the use of terra cotta and brick has steadily increased, in spite of the numerous failures which have had to be reported at times, and notwithstanding the quantities of poor bricks, soft terra cotta, and positively bad workmanship which have been inflicted upon a long-suffering community, ought to be sufficient evidence that without any derogation to the artistic and practical uses of stone as a building material, the burnt clay products must have a great deal more to recommend them than the mere cheapness in first cost.—*The Brickbuilder.*

MINNESOTA SANDSTONES*

THE stone quarried at Hinckley, in Pine county, bears so strong a resemblance to that quarried near Fort Snelling, in Dakota county, both in general outward appearance and in its chemical and physical characters, that it may on these grounds be supposed to belong to the same formation. And since there are no stratigraphical nor structural difficulties opposed to such a reference, but rather evidences of such irregularities as to require it, they are here considered as belonging to the Potsdam formation, near the horizon of its passage into the St. Croix. The Hinckley rock is but slightly exposed. Its color is light-yellow or sometimes with a pinkish tint, and its grain is uniform and arenaceous. Its strength under pressure is very great, amounting to 17,500 pounds per square inch when placed on edge, and 19,000 pounds per square inch when on bed.

The largest of the individual quartz grains composing this rock are about one-half millimeter in diameter, but in general they are about one-tenth millimeter. They are rounded as by attrition among themselves, and their shape is sub-angular. Their exterior is minutely roughened and in these depressions is deposited the cement which furnishes the bond of the rock. Many of the grains also are interpenetrated by impurities which are ferruginous and give them a yellowish tint, but for the most part the quartz is pure and perfectly clear. Cavities in the quartz grains are sometimes in parallel lines. While the exterior of the quartz grains is coated with a sprinkling of yellowish ochreous impurities, the cementing bond is largely calcareous, but so meager that there are interstitial cavities between the grains of quartz.

The sandrock quarried near Fort Snelling, has occasionally a grain of feldspar mingled with the quartz, and some of the quartz contains small acicular crystal inclusions that resemble apatite: Otherwise it is exactly like the other. It has, however, a little more copious and darker-colored cement, with an occasional rounded grain of magnetite. The Fort Snelling quarry was opened in 1869, but was not used very much, after the construction of the railroad bridge over the Minnesota, till 1878, when the highway bridge over the Mississippi was constructed. The strata are homogeneous, horizontal and about two feet thick as quarried, the color being a rusty yellow with some broad banding of lighter yellow. It is liable to inequalities in hardness and durability. Its color gives it an attractive exterior, and

*Extracted from the Geological and Natural History Survey of Minnesota.

renders the tall piers of the Fort Snelling bridge an object of admiration to all architects.

The sandrock quarried at Dresbach, in Winona county, is largely feldspathic, and rather soft, but it becomes harder on the drying out of the water which it contains in the quarry. It belongs to the St. Croix formation and very near its lowest part. The great anticlinal of that formation crosses Winona county, bringing to view lower strata of the St. Croix than can be found along the Mississippi in any other county in that part of the state. These lowest beds cannot be found in the Mississippi bluffs further south, nor north. They probably might be opened in numerous places in the valley of Root river and its tributaries, in Houston and Fillmore counties, in the direction of the anticlinal, which enters the state from Wisconsin. In the valley of Black river, at Black River Falls, thirty-three miles from the Mississippi, east of Winona, the crystalline granites and schists appear, brought to the surface by this anticlinal.

The stone is evenly granular, gray, and of a medium-sized grain, very much resembling the Berea sandstone of Ohio. It is in beds that are quarried out from six inches to three or four feet thick. It is free from nodules of pyrite or of coarse quartz pebbles. It can be sawn easily, and dressed with great facility with a hammer and chisel. Its strength in crushing pressure is 6,500 pounds per square inch when placed on its bedding plane, and 3,750 pounds when placed on its edge. Though ranking somewhat lower than the Berea stone in that respect, it will become stronger as the quarries progress. Its strength is ample for the largest structures, and its durability under the weather is evinced by the projecting terrace-like shoulder which it causes along the base of the Mississippi bluffs. Its naturally gray color is found at a depth of a few feet from the weathered surface, the weathered and faded condition of the same strata being seen in the quarries at Dakota about a mile above Dresbach. It then becomes lighter, both in weight and in color, absorbs moisture much more readily, is more affected by freezing and thawing, and also is less able to maintain itself intact in case of fire followed by water thrown upon it. It also loses from one-sixth to one-third of its crushing strength.

The grains are angular or sub-angular, and include some that are feldspathic. The latter retain a trace of cleavage in the parallel disposition of the lines of minute impurities which darken them, and occasionally also show a minute striation as if triclinic. The stone shows, in thin-section, frequent grains of green sand which have a closely netted internal structure, which in high powers shows an aggregation of globules. Scattered through the section are conspicuous, elongated, nearly parallel, somewhat club-shaped, brown grains which are probably sections of fragments of phosphatic bivalves. An occasional aggregation of minute pyrite crystals may also be

seen in reflected light. Muscovite is the only mica, and that is in very rare scales. Ocher is nearly wanting in the gray-colored stone of Dresbach, but is much more frequent in the weathered stone quarried at Dakota in the form of irregular clouds and patches.

The stone quarried at Jordan, in Scott county, is from the typical locality of the Jordan sandstone formation, and is very similar in all respects to the rock from Dresbach, except that it has a greater amount of insoluble matter, and less of calcareous cement; its alumina also is in greater proportion. This rock is but little quarried in the state. Its line of outcrop is quite narrow, being situated between two firm and persistent limestones. Hence its superficial exposure is mostly confined to a turfed slope along the bluffs of rivers near the top, just below the Shakopee limestone. It is thus seen in numerous places in Fillmore, Olmsted, Winona and Houston counties, at points some miles away from the Mississippi river. It is not known at any place in the bluffs of the Mississippi south of Hastings. It can be seen at Stillwater, in Washington county, and probably exists in the second terrace flat at Nininger in Dakota county. Its outcrop at Jordan is along Sand creek, and rises but few feet above the water. No other rock formation is visible, and were it not for the relation in which it is placed by the dip or the formation as seen at the islands in the river, and at Louisville, its true position in respect to the outcrop at St. Lawrence would not be made out correctly. The strata are from two inches to two feet in thickness, but cut by rather frequent joints; still there is no difficulty in obtaining blocks as large as needed for ordinary construction.

When the rock is taken from below the water level, or from deep excavation, it has the gray color of the Dresbach stone, but some of it is much stained in stripes, parallel with the sedimentation, with iron-rust. This probably renders it firmer, as well as darker, and gives it much the appearance of the rock quarried near Fort Snelling already mentioned. The crushing tests that have been made on the rock of these two colors from the same quarry show the greater strength of the rusty layers. They also show that the rusty stone absorbs moisture more rapidly, and is easily destroyed by corrosive and other vapors, at least in the case of those portions containing considerable lime and magnesia, rendering them less valuable as a building stone.

This stone has no greensand grains, or very few; some of the grains are of orthoclase feldspar; occasionally a muscovite scale can be seen; films of ocher are common, some of them being square, as if the product of changed pyrite. The most of the rock consists of fine quartz grains which are rounded or sub-angular, some of the largest being a fifth of a millimeter in diameter.

The red sandstone from Fond du Lac, St. Louis county, is of the Potsdam

formation, and extends along the south shore of Lake Superior eastward, forming the bluffs of the Apostle islands and of the mainland at numerous points. At Siskiwit Bay, near the west end of Lake Superior, the rock is of the same formation, presumably, as the quartzite near New Ulm and in Pipestone county. The layers are tilted, at Fond du Lac, toward the southeast. They are associated with, and overlie, a vast amount of soft red shale which passes sometimes to a shaly red conglomerate, the same that in other places about Lake Superior is in contact with the igneous rocks and becomes copper-bearing. This red sandstone is well known in Milwaukee, Chicago and Detroit. The quarries in it further east furnished the red sandrock used in the Milwaukee court house, and a great many brownstone fronts in that city and in Chicago were obtained from it. It was formerly quarried on the south side of Siskiwit Bay, on Isle Royale, and sold in Detroit as *Isle Royale brownstone*. While it consists largely of quartz, the grains are not so firmly cemented or united as to render it objectionably hard except when it has been subjected to metamorphic agencies, as in Pipestone county and in some of the analogous knobs seen in the northern part of the state. On Isle Royale, when quarried, it is fine-grained and rather brittle, being more metamorphosed than at Fond du Lac. At some points it has a mottling of red and gray, as at Sault St. Marie, at the eastern end of Lake Superior, where the ship canal is cut in it, and largely built of it. At Fond du Lac it has also a mottling of green, particularly at the quarry on Mission creek. In some places it is so loosely cemented as to crumble and to be rendered useless for building, and in others it contains pebbles, and even stones several inches in diameter, of white quartz, or even becomes wholly conglomeritic. Nearly all these featnres can be seen at Fond du Lac, but there is still at that place a great abundance of fine stone of the best quality. Its strength under pressure is from five to eight thousand pounds per square inch, tested for the survey by General Gillmore.

At Fond du Lac this stone, while in general of a reddish-brown color, is variously marked with spots and stripes of lighter shade. It also has occasional grains of quartz as large as a pea, or even as large as a hen's egg, distributed especially through the lighter colored portions, but not much of it is conglomeritic. Sometimes flattened lumps of red shale from two to five inches across are seen arranged in belts coincident rudely with the stratification. The strata are of all thicknesses up to three or four feet, and very large blocks are obtainable. The stone appears, and has been worked, on both sides of the river, but the principal excavation is on the Minnesota side from twenty to forty feet above the water, near the St. Paul and Duluth railroad. It is also opened on Mission creek, north of Fond du Lac, where some very fine stone has been taken out.

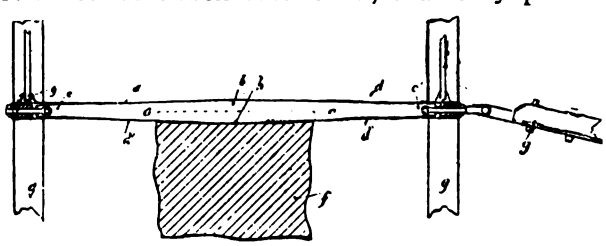
About two-thirds of this rock consists of rounded and sub-angular grains

of quartz, the most of it being pure and limpid, but some of it having numerous globular inclusions. Nine-tenths of the remainder may be regarded as feldspar. This is often crowded and darkened by ocher and ferrite, but is sometimes white and kaolinic. Occasionally can be seen a fibrous, light-green, angular grain that has apparently resulted from hornblende or from augite. A few fibrous serpentinous partings surround and separate some of the feldspars. Apatite spicules cut some of the quartz. A few black grains are magnetite. A little calcite is distinguishable.

The sandrock which has been somewhat quarried and used at Taylor's Falls is very similar to that obtained at Jordan. It is of a light color, rather friable on first quarrying, hardens on exposure, and is in heavy natural strata from which blocks of any desired size may be taken. It belongs to the St. Croix formation, and is extensively exposed in the bluffs of the St. Croix and Mississippi rivers, but in a higher horizon than the Dresbach stone. *N. H. Winchell.*

AN IMPROVED STONE SAW BLADE.

THE sketch shows the construction of a stone saw blade recently invented by an English stone-worker. It is claimed to be more durable and efficient than the ordinary straight flat blade. As will be seen the blades or saws are made broader in or about their middle or central parts, and narrower towards their outer ends; thus they present what is usually styled a duplex fish-back shape, the outer edges being formed to bulge in the central part of the blade, and by an appropriately shaped curve gradually approach each other toward both ends.



By employing blades or saws of this formation, the grit or abrading substance used in connection with them is kept better in position for performing the functions desired of it, while what are known as black cuts are entirely prevented, and provision is made to compensate for the wear of the blades where it is most needed.

The blades may be used in connection with any of the machines at present in use, since their said formation does not in any way interfere with their method of fixing.

ROPE POWER TRANSMISSION.*

ROPE-POWER transmission is comparatively a development of recent times. Although ropes were used in isolated cases for this purpose many years ago, it may be said, so far as this country is concerned, that the last ten years have seen the adoption of rope-power transmissions become more general and the system take recognized place in the field of mechanical engineering.

There are two general systems in vogue, which may be designated as the "English" and the "American." The former employs one or more single ropes, whereas the latter uses one continuous rope and employs a tension carriage, operating on one of the turns of the rope, to insure a uniform amount of work being performed by each wrap around the wheels.

Wheels, or sheaves, used in connection with the rope for the purpose of transmitting power, are made with V-shaped grooves in the rims, the most commonly accepted angle being 45°. These grooves are made sufficiently deep to prevent the rope bottoming, or resting upon the bottom of the groove, the object of this being to increase the resistance to slipping and enable a moderate weight on the tension carriage to give sufficient driving force.

Sheaves used in conjunction with manilla rope are made in two ways, the older method being to cast the sheaves with sufficient width of face for the number of grooves desired and to roughly core the grooves, so as to lessen the amount of iron to be removed by the turning tool in finishing them. It is necessary to cast the wheels sufficiently heavy to resist the pressure of the turning tool, in order to have the finished wheels as round as possible. It is almost, impossible, however, to avoid a small amount of spring between the arms, so that upon careful measurement the wheel is found to be polygonal. This is notably the case when the cut is heavy, it being necessary, in order to obtain a good result, to take a roughing cut, which releases the skin tension of the casting and permits it to take a modified shape, due to the internal strains ever present in cast iron wheels designed to have the outer surface removed from them by turning. Then a second cut is taken, and finally a finishing cut is made with a tool ground to the exact shape of one of the finished grooves, this last cut, which is made more to true up the inequalities of the previous work, removing but

*A lecture delivered before the Franklin Institute of Philadelphia.

very little metal. In the foundry work connected with the manufacture of these wheels, it is seldom that a wheel having two or more grooves in it is so perfect that upon turning imperfections are not discovered. These, of course, if too numerous, render the condemnation of the casting necessary. If, however, the sandholes, or blowholes, in the turned surface of the sheave, are not too large, they are filled with babbitt metal, and the sheaves are put in use. The amount of metal turned from castings for rope sheaves is astonishingly large; for instance, in the case of a five-groove sheave of 48 inches diameter, for 1⅛-inch rope, the rough weight before turning was 698 pounds, and after finishing the weight was 567 pounds, showing that 131 pounds had been turned off the original casting. This proportion would, of course, vary somewhat, dependent upon the care taken in the foundry, but at the same time it is always greater than would be supposed.

The second and newer method of manufacturing sheaves is that practiced by the "Link-belt" companies and differs from the already described method in two very important features. In the first place, the sheaves are not turned after being cast, great care being taken in the proportioning of the hubs, arms and rims, so that the castings can be made of extreme lightness, but being devoid of internal strain are very strong. The grooves are cast on green sand cores, a three-part flask being used. By this we mean the flask has a cope and a drag, as is common in all foundry work, but between them is placed what is known as the "third part," or "check piece," which holds the sand destined to form the grooves in the finished wheel. It has been found in practice that it is possible to cast sheaves in this manner that are fully as accurate as turned ones, and with an average saving in weight of 17.2 per cent., thus saving in weight, of course, effecting a corresponding economy in the power required to operate a rope drive furnished with them.

The second radical difference between the "Link-belt" sheaves and the solid turned sheaves is, that the manufacture of multiple groove sheaves, or those having more than one groove, is effected by bolting together what are known as arm sections (which are really complete sheaves of one groove) and rim sections (which are simply grooved rims cast without arms or hubs). This plan makes it possible to vary the weight and strength of multiple groove sheaves by using a greater or less number of arm sections, dependent upon the size of the rope to be used and the varying conditions of their employment. After the sheaves are "built up," as is termed, they are bored out, and to show the trifling difference in weight between the rough and finished sheaves, I would state that a 48-inch, five-groove sheave for 1⅛-inch rope weighs in the rough 433 pounds, and when finished 423 pounds, or 144 pounds less than the finished solid-turned sheave referred to previously.

So great is the care taken in the casting of "built-up" sheaves, that the

only finishing required in the grooves is that of smoothing the casting by holding a block of emery in the groove while revolving at a speed of about 120 revolutions per minute, the finishing of each groove in this way not occupying more than three or four minutes.

An incidental advantage of the multiple groove "built-up" sheave is, that after a rope drive is erected and the necessity arises for the transmission of more power than that for which it was originally designed, additional ring section may be added to the sheaves, and by splicing in an additional piece of rope, the desired increased transmitting capacity may be secured.

It is obvious that in the use of a single rope making a number of wraps around two wheels, it is essential that the diameters of the grooves at the pitch line, which is the arc of contact of the ropes, must be uniform in all of the grooves in any one sheave; otherwise, there would be a tendency on the part of some of the wraps of the rope to travel faster than the others, which tendency must be counteracted by the slipping of the rope in some of the grooves, this, of course, resulting in a loss of power, and also in the rapid wear of the rope. So important is this feature, that great care has to be taken in splicing the rope, so that the diameter at the splice will be no larger than in the body of the rope. An increased diameter at the splice would, of course, moke the splice travel around a larger circle on the sheave by its not being able to take as low a position in the V-shaped grooves.

It is impossible to splice a rope without impairing its strength at the splice, provided its diameter is not increased. What is ordinarily known as the "short splice," or the "long splice," as used by sailors, will not answer at all. It is essential that a splice (for instance, in a rope one inch in diameter) should be from ten feet to twelve feet long, and made with great care, so that after the splice is complete the tension to which the rope is subjected is evenly divided among the strands of the rope.

Durability of manila rope transmissions is dependent upon various conditions, the most important one probably being the quality of the rope. In order to make good rope it is necessary that the fibers employed in its manufacture should be long and of nearly uniform size. The fact that the fibers of manila have a rough interior and are of great strength in proportion to their weight, is an important factor in the strength of the rope when subjected to a tensile strain, but at the same time this very roughness becomes an element of destruction when the ropes are passing around sheaves which cause the fibers to slide upon each other, so that the internal wear of a rope becomes a most serious agent in destroying it. A worn-out rope untwisted so as to expose the strands will show a fine powder which has been chafed off the fibers. Of course, after this has been detached from the fibers, it leaves them weaker than in their original condition. It is also noticeable that the fibers of manila, being composed of elongated cells, are not perfectly adapted to continued bending.

In order to counteract the destructive tendencies enumerated, it is essential that the rope should be lubricated. This is accomplished in two ways, the first being by the introduction of a lubricant in the manufacture of rope; notably, as in the case of what is known as the "stevedore," into which tallow and graphite are introduced at the time the rope is made, the effect being to increase the flexibility of the rope, increase its life and to render it to a degree waterproof, and also in the ropes of other makes, which are laid with tallow. The second method is to coat the outside of the rope with a mixture of lamp-black or graphite and grease, relying upon the working of the strands of the rope with relation to each other to work the compound through it. This latter method is practiced on the Continent, and is also being made use of in this country to a considerable extent.

Some of the larger constructors of rope transmissions in England claim that manila rope should never be used under any circumstances; that cotton is the only fiber that will give satisfactory results. I have seen samples of a rope 1⅜ inches in diameter, which had been in constant use ten hours a day for nearly sixteen years. This was a cotton rope, known as the "Lambeth," the peculiarity of the construction being that it was primarily made of cotton, but each of the four strands of the rope was covered with a number of tightly twisted yarns, forming a protecting envelope, which prevented cutting or wearing of any of the strands proper of the rope. Of course, cotton ropes are much more expensive than the manila ones, and a rope such as the "Lambeth" must necessarily be the most expensive of those made of cotton.

It is unquestionably true, that in time cotton ropes will be more extensively used in this country, crowding out the use of manilla; but it is a fact that the introduction of any radical departures in the field of mechanical engineering are only possible by offering not only the best means of transmitting power, but also the cheapest. Ultimately, and as users of rope drives become more familiar with their intrinsic advantages, they will be more ready to increase the original outlay and put in the best rope that can be made.

If manila rope transmissions are designed with good judgment and are properly erected, there is no possible doubt of their giving satisfactory results. The prevailing notion is, however, that as rope is flexible in all directions, rope drives can be constructed in a haphazard manner, without special care being exercised in getting the sheaves in exact alinement, and considerable criticism has been engendered by lack of attention to the important details. When borne in mind that a rope used for the transmission of power runs at a speed as high as 5,000 feet per minute in many cases, and as a rule the rope is run in close proximity to the ceiling, which is the hottest part of the room, it is not surprising that the rope becomes dry and cor-

respondingly brittle; hence the importance of lubricating it in some way, to counteract the drying tendency. It is not uncommon to find rope transmissions erected so that the sway of the rope will occasionally bring it in contact with a beam, which, of course, results in extremely rapid wear of the outside of the rope. The fact that conditions of this kind exist is sometimes hard to discover, as when the rope is at rest it may apparently have abundant clearance throughout the path of its travel. One case brought to my attention, in which the rope was being rapidly worn out, resulted in the discovery of the fact that in its passage throngh the wall of a building, the rope would sway and come in contact with the edge of a corrugated iron covering of the building. On calling this condition of affairs to the attention of the parties operating the drive they seemed quite surprised that such a trifling thing as the occasional touching of the rope on the corrugated iron should in any way impair the life and usefulness of the rope.

Manila rope is usually run under a working strain equal to 3 per cent. of its ultimate breaking strain and at velocities varying from 3,000 to 5,000 feet per minute.

To determine the power which any rope will transmit at a given speed, it is necessary to ascertain the nature and amount of the strains to which it is subjected while running, and then to find the exact part of the total working strain which is expended in performing useful work.

Generally speaking, ropes in the "American" system are subjected to three principal strains, viz., the strain due to the power transmitted ; that due to centrifugal force ; and that due to tension carriage weight. Besides these three there are the minor strains, due to the weight of the rope, the internal resistance of the rope to bending and the strains required to make the rope enter and leave the wedge-shaped grooves. With good ropes, running in well-made grooves, the minor strains do not probably absorb more than 5 per cent. of the working strain of the rope.

As an illustration of the method of determining the horse-power of a rope in the American system, let us assume the case of a 1-in. rope traveling at a speed of 4,500 ft. per minute. The breaking strain of this rope, as given by the Plymouth Cordage Co., is 9,000 lbs., and according to the limitation imposed by good practice, the total working strain should not exceed 3 per cent of this, or 270 lbs. Deducting 5 per cent for the minor strains, we have 257 lbs., which represents the sum of the three principal forces.

In order to obtain the effective strain, or driving force, it is first necesary to find the strain due to centrifugal force. This force varies directly as the square of the speed, and may be found by multiplying the square of the speed in feet per second by the weight of 1 ft. of rope and dividing the product by 32.

Now, the weight of 1-in. manila rope per foot is 0:33 lbs., and the centrifugal force, therefore, equals:

$$\frac{75^2 \times 33}{32} \text{ or about } 56 \text{ lbs.}$$

Substracting this from 257 lbs. we have 201 lbs. as the sum of the strain due to the power transmitted and the strain do to the tension carriage weight.

Now a series of carefully conducted tests have established the fact that a weight of (say) 50 lbs. on one end of a rope wrapped halfway round a sheave having a 45 V-groove, will sustain, without slippage, about 3½ times its weight at the other end of the rope. Assuming, for the sake of safety, that ratio is as 1 :3, it is evident, that to sustain a strain of 201 lbs on the tight side without slippage, it is necessary to maintain a tension of ⅓ this amount or 67 lbs. on the slack side. The effective strain, or driving force, will, therefore be equal to the difference of these strains, or 134 lbs., which at 4,500 ft. per minute, will transmit.

$$\frac{4,500 \times 134}{33,000} \text{ or } 18.4 \text{ H P.}$$

In the same manner we find, that at a speed of 1,800 ft. per minute, the centrifugal force is only 9 lbs., and the effective strain is 166 lbs., transmitting 9 HP.; while at a speed of 6,600 ft. per minute, the centrifugal force is 125 lbs. and the driving force only 88 lbs. transmitting 17,6 HP.

On reflection it is evident, that as the speeds are increased the centrifugal force increases, and the effective tension must be reduced to avoid overstraining the ropes. At a speed of about 4,800 ft. per minute the ropes attain their greatest efficiency; that is, they will transmit more power with the assumed working strain than at any other speed, either higher or lower, although there is but little variation in the power transmitted at that speed and the power transmitted at either 4,200 ft. per minute, or 5,400 ft. per minute, thus giving a wide range from which to choose. It is well to bear in mind, however, that the higher the speed the greater the wear of the rope and that for this reason the slower speed is the more economical. All things considered, speeds of from 3,600 to 4,200 ft. per minute are the best.

It may be well to note that for the working strain assumed, 3 per cent of the ultimate breaking strain, 40 diameters, should be regarded as the minimum size of sheaves to be used. If it is necessary to use sheaves of smaller diameter, the working strain should be proportionately reduced. Thus, in the case previously considered, a 1-in. rope at a speed of 4,500 ft. per minute transmitted 18,4 HP.; now if it is desired to use a 30-in, wheel as a driver, it is advisable to reduce the power transmitted to three-quarters of 18.4, or 13.8 HP. This rule does not apply to the driving and driven wheels, but also to any intermediate idlers around which the rope may be called upon to bend.

The idlers of rope transmissions have usually been made with semi-circular grooves, permitting the ropes to rest upon the bottoms of them. It has been found better, however, in practice to use the V-shaped groove for all purposes, as it insures a revolution of the idlers at the same speed at which the rope is traveling, and thus prevents the wear due to the slipping of the rope in the grooves of the wheel, It has been shown that idlers having semi-circular grooves in them become highly polished, while those having V-shaped grooves do not. Thus the demonstration that the ropes slip to a certain extent in passing over idlers with the semi-circular grooves is complete.

The use of the tension carriage in the "American" system of rope transmissions is twofold. In the first place where a continuous rope is used passing over the grooves of two sheaves, it is obvious that the rope must be wound spirally around the two wheels, and that unless the rope in passing off the last groove of one of the wheels is not conducted back again to the first groove of the wheel the drive would become inoperative from the fact that all of the wraps of the rope would soon run off and leave the wheels without connection between them. In order to make this return, the wheel of the tension carriage is set at an angle so as to enable it to make the proper return of the rope. Secondly, the tension carriage is weighted so as to give the proper tension to the rope and serve as a corrective agent to the trifling inequalities that may exist in the sheaves or in the rope. It is by the weighting of the tension carriage that we are enabled to tell the exact amount of strain to which we are subjected a rope. I might add that the tension carriage being mounted on guides, it is capable of maintaining the proper tension of the rope, evan if the latter becomes considerably elongated by the strain put upon it, or is variable in its length due to atmospheric changes. This letter is especially noticeable in rope transmissions which are used wholly, or in part, out of doors, they being subjected to the action of rainy and dry weather.

The use of wire rope for the transmission of power I will only briefly touch upon, by stating that the economic use of it seems to be confined to transmissions of great length. The sheaves employed have to be of very large diameter, otherwise the rope becomes crystallized and is of short life.

With reference to rawhide I might say that its cost has prevented its general adoption, as it is cheaper to use an increased number of strands of manila rope to accomplish the desired result, though it has one marked advantage, inasmuch as it is possible to use it on sheaves of smaller relative diameter than in cases where manila rope is employed.

If possible in running the rope care should be taken to have the bends all in one direction, as a rope bent in opposite directions will wear with much greater rapidity.—*Jas. M. Dodge, M. Am. Soc. M. E.*

SETTING OUT WORK OF DOUBLE CURVATURE.*

FIG. 1 shows plan and Fig. 2 the elevation of a stone arch in five pieces, circle on plan and semi-circle in elevation on the outside. The joints are out of winding—that is, they are the same pitch inside as out. It will be noticed that both the soffit and back or top of arch in elevation is drawn to a semi-circle, the center from which the top of arch is struck being raised sufficient for that purpose. Divide the soffit (Fig. 2) into five equal parts, and draw the joints to the center, as shown. From the intersection of these lines with soffit, drop perpendicular to outer circle of plan in *a*, *b*, *c*. *d*, and draw to the center. Now draw parallel to S S (Fig. 2), from *b* to *c* and from *a* to *d*. These lines have cut the center line in E and F to get the moulds for the bottom stones, Nos. 1 and 5. At Fig. 1 draw a line through G and H on inside curve of plan; also one parallel to it, touching outside curve, as shown by X Y. From J, on X Y, erect a perpendicular to cut the horizontal through intersection of joint line and soffit (Fig. 2, in J'). Notice, the soffit of jamb (Fig. 1) happens to be square to X Y, therefore, join K to J', for underside of mould in elevation; draw the parallel touching the outside curve, and set off N N to equal *o o* (Fig. 1). Now, at Fig. 1, draw the horizontal trace of joint plane through F parallel to J *d* G, as shown by F. L. At Fig. 3, make L J R K P equal corresponding letters on X Y (Fig. 1). Make K K', J J', equal corresponding letters, Fig. 2, and join K to J' for underside of mould, and draw the top edge through K' parallel to it. Draw the joint from L through J', as shown. The stone can be got to the shape of the mould, Fig. 3, as shown by P K J' K' P', with all the edges square to the outside face, which must be got true. The thickness of stone will be R G, Fig. 1. To get the face-mould for top and bottom edges, make R' S G, K' V, P' H equal to R S G, K V, P H, Fig. 1. Draw P P through *s* parallel to joint, draw N N', and make N' W equal R G. This mould is applied where it is on the top edge, and on the bottom edge J'' on mould is placed to J' at the intersection of joint and underedge. The plan mould is applied from K to P. The top joint will be worked off to bevel of top end of face-mould, as shown by J'' W, after which the joint mould is applied from J' to K'. Now work both inside and outside off to these moulds in a vertical direction—that is, in the direction of K K', P P', etc. Then apply the falling moulds inside and out, and work the superfluous stuff off the top

*From *Illustrated Carpenter and Builder.*

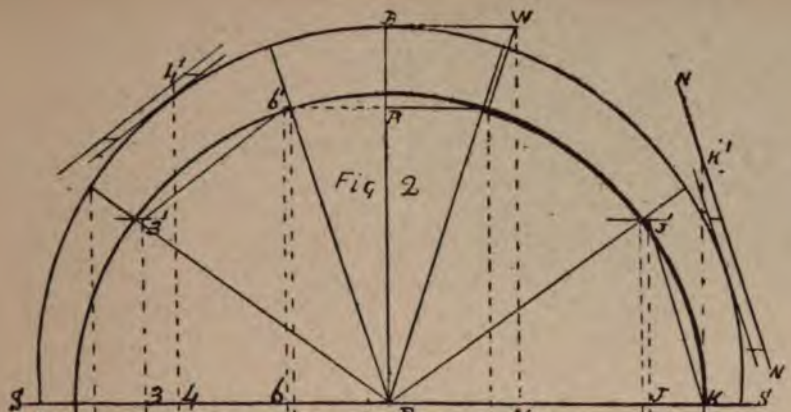


Fig 2

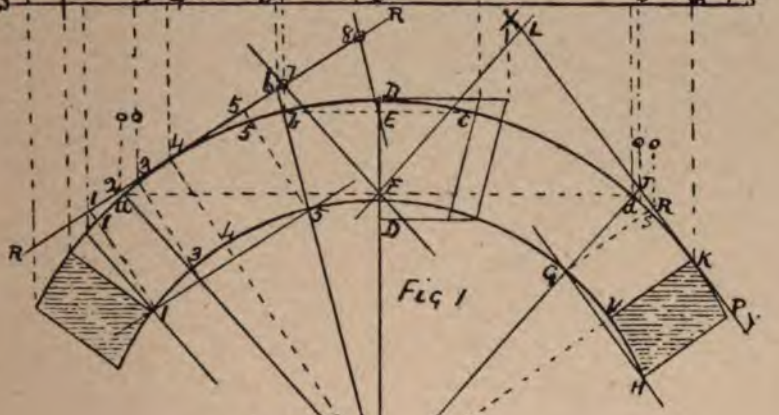


Fig 1

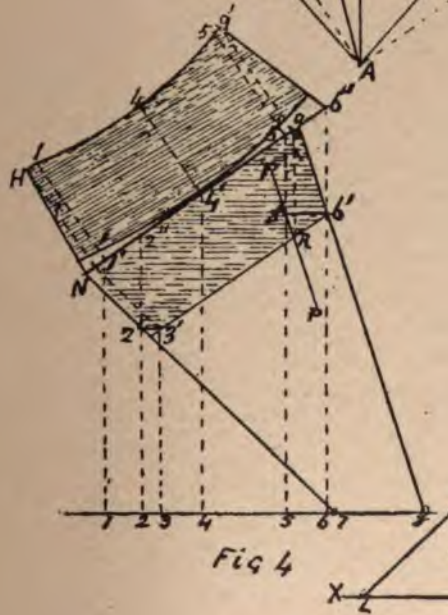


Fig 4

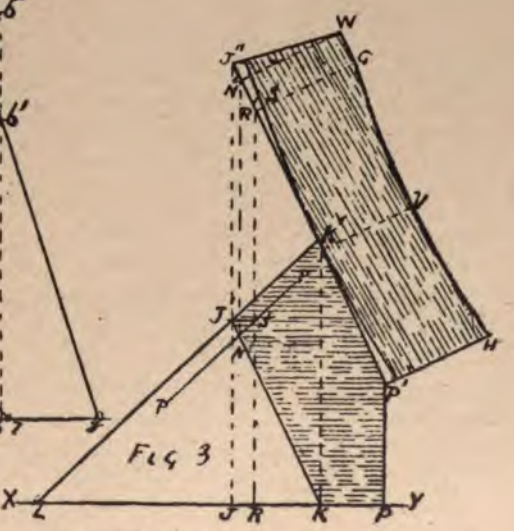


Fig 3

and soffit. NOTE.—The falling mould will apply from K to J′ on the outside and from K to S on the inside.

To get the moulds for No. 2 stone, draw the horizontal traces of joint planes parallel to plan of joints, 6 *b* 5, and 2 *a* 3, as shown by E 8 and F 7, respectively. Draw 1 1 1, 3 3, 4 4, 5 5 5, square to R R. Make 1, 2, 3, 4, 5, 6, 7, 8, Fig. 4, equal corresponding figures on R R, Fig. 1. Make 2 2′, 3 3′, equal 3, 3′, Fig. 2, and 4 4′, 6 6′, equal corresponding letters, Fig. 2. Join 2′ to 7 for the bottom joint, and 6′ to 8 for the top joint; joint 6′ to 3 for the underside of mould, and draw the top edge parallel to it through 4′, as shown. To get the face-moulds and cross-joints: Sqnare out a line from 6′ to cut 5 5 in S, draw P P through S to cut underside of mould in R. From R erect a vertical line to cut top edge in 9, square out a line, and make 9 9′ equal 5 5 5, Fig. 1. Join 6″ 9′ for top end joint. At bottom end draw a line from 3 parallel to joint. Square out a line to H. Make 1′ 1 1, 4′ 4, 5′ 5 5 equal corresponding figures, Fig. 1, and complete the mould as shown. The working of the stones will be almosi a repetition of Fig. 3; No. 3 or crown stone will be easily understood. D D, Fig. 1, will be its thickness; B B and B W, Fig. 2, will be the width and half length respectively.

W. H. Wood.

EXPORTS DECLARED [IMPORTS TO] FOR THE UNITED STATES.

QUARTER ENDING JUNE 30, 1896.

ARGENTINE REPUBLIC.

Buenos Ayres—

Onyx	$ 262.00

BELGIUM.

Brussels—

Cement	145,873.55
Marble	1,585.05

Charleroi—

Cement	17,135.69
Marble	1,149.19

Ghent—

Cement	4,936.38

NEW BRUNSWICK.

St. John—

Cement	183.75
Granite	2,777.50

St. Stephen—

Granite, rough	197.00

NOVA SCOTIA.

Port Joggins—

Grindstones	2,380.00
Whetstones	15.00

Pugwash and Wallace—

Building Stone	1,276.00

ONTARIO.

Clifton—

Dressed stone	220.00

QUEBEC.

Montreal—

Cement	8,313.34

DENMARK.

Copenhagen—

Cement	14,204.36
Marble	661.26

FRANCE.

Caudry—

Marble	530.94

Cette—

Lithographic stones	204.19

Marseilles—

Cement	7,055.85
Marble	4,915.85

Paris

Stones (millstones, marble, etc.)	8,859.67

GERMANY.

Bamberg—

Grindstones	353.06

Bremen—	
Cements	18,642.54
Cassel—	
Portland cement	11,662.30
Frankfort—	
Cement	43,300.05
Mannheim—	
Cement	39,464.19
Mayence—	
Cement	71,159.07
CHINA.	
Hongkong—	
Cement	3,980.00
ITALY.	
Carrara—	
Marble:	
Blocks	100,847.86
Slabs	26,681.62
Worked	5,619.70
Statuary	19,238.45
Tiles	4,418.70
Cubes and chips	4,059.37
Florence—	
Marble statuary	6,182.000
Genoa—	
Marble, works of	145.27
Whetstones	157.53
Leghorn—	
Marble	
Blocks	794.23
Statuary	721.43
Milan—	
Granite	122.71
Rome—	
Marble and terra cotta	2,867.96
Marble statuary and pedestals	11,883.75
Venice—	
Marble, carved	131.81
Stone	1,021.67
MEXICO.	
Monterey—	
Marble	203.43
Toreon—	
Rough onyx	19.75
Veracruz—	
Marble	4,187.00
Onyx	27,158.93
SWEDEN AND NORWAY.	
Christiania—	
Marble, in blocks	2,103.51
UNITED KINGDOM.	
Aberdeen—	
Granite, polished	81,313.00
Bradford—	
Stone	507.90
Carlisle—	
Stone, building	183.10
Dublin—	
Marble	5,451.33
Glasgow—	
Stone and stoneware	1,358.48
Hull—	
Cliff stone	6,422.73
Liverpool—	
Cement	37,856.49
Mill and other stones	6,360.50
Slates, bricks, and tiles	5,163,35
London—	
Cement*	185,478.56
Stone, marble, granite, etc*	85,996.93
Cement	143,954.94
Stone, marble, granite, etc.	6,215.37
Newcastle—	
Cement	5,275.29
Stone (grindstones)	10,307.25
Sheffield—	
Grindstones	1,019.54
Troon—	
Hone stones	1,254.38

*Quarter ended March 31, 1896.

[Regular Correspondence STONE.]

NOTES FROM ABERDEEN.

To the Editor of STONE:

DEAR SIR:—The result of the United States Presidential election has given satisfaction in this quarter, as it is expected that the revival of trade generally in America will ultimately benefit the granite industry here. It is hoped that as we in Britain admit American wheat, cotton, bacon, cheese, and other produce free, a prohibitive tariff will not be imposed against us in respect of monuments of Scotch granite.

The monumental trade here is still dull in the American branch, and there has been another failure locally, where the dividend will be very small. The house building trade continues busy, though the recent advance in the value of money may check the boom somewhat. Quarrying and sett-making industry in this quarter satisfactorily prosperous.

Contracts have been accepted for erecting the south wing of Marischal College in this city. As a further part of the University buildings extension scheme, the University Court will on the 15th of May next, hand over to Aberdeen Town Council a site on the east side of Broad street in order that that body may re-erect the old Gray-friars church. The removal of the old church and the construction of a new one will cost about $53,000. The new south wing of Marischal college for the Natural Philosophy department will cost about $60,000. There are no funds in hand meantime to construct a terminal town at this wing. It will be of fireproof construction throughout, the internal walls being of white granite.

Competitive designs are asked for a central engine station in Aberdeen, the buildings to be of granite—total cost (including site) about $90,000. The mason work of new electric lighting station, Cotton street, in this city, has been completed. The front elevation is in light-gray granite, and the rusticated portions form a pleasant contrast with the finer dressed portions.

I don't know how the gentlemen in the stone trade on your side look on these matters, but perhaps I should record honors recently conferred on members of the granite trade here. Mr. John Fyfe, the well-known quarry-owner, and Town Councillor W. Boddie have been put on the roll of Justices of the Peace for Aberdeenshire, for life; and Town Councillor James Taggart has been elected one of the unpaid magistrates of Aberdeen city, his title in Scotch phrase being now Bailie Taggart.

The Sir Charles Cameron Memorial Fountain (in the French Renaissance style) in Glasgow was unveiled on the 24th ult. The drinking basins and under portion are of polished Peterhead granite, and was constructed in Aberdeen, and the central part of the foundation is also of red granite. The rest of the Memorial is of terra cotta. There are two bronze medallions of Sir Charles (who was for twenty-one years one of the members of Parliament for Glasgow) under the north and south dials of the clock below the cupola.

A bronze statue (five feet three inches high) on a pedestal (five feet high) of yellow Preedham freestone is to be erected at a cost of $5,000, in the new booking office, Waverly Railway Station, Edinburg. The subject is the late Mr. John Walker, manager North British Railway Company, and the sculptor is Mr. W. B. Rhind, A. R. S. A.,

Edinburgh. The figures will be seated, and the pose as well as the moulding of the draperies is broad as well as simple in treatment.

The granite monument ordered by Queen Victoria, to commemorate her son-in-law, the late Prince Henry of Battenberg, has now been erected in the woods of Ballochbrie, near Balmoral Castle. The whole estate there is the Queen's private property. Her Majesty and her widowed daughter, Princess Henry of Battenberg (née Princess Beatrice), inspected the monument on Thursday last before leaving Balmoral for Windsor. The manager of the Aberdeen Granite Works, where the Memorial was chiseled, Mr. R. Lawson, was presented to the Queen, who expressed herself highly pleased with the work. The verses on the front of the monolith are by the Marquis of Lorne. They read:

"Brief life! In sport and war so keen,
Mourned by these winds in heath and fir,
As where the falling breakers stir
The palms that crown thy closing scene."

Some way beneath this is the following inscription in raised, dull-polished letters:

ERECTED TO
THE DEAR MEMORY OF
HER BELOVED AND LAMENTED SON-IN-LAW,
HENRY MAURICE,
PRINCE OF BATTENBERG,
BY VICTORIA, RI., 1896.

The carving is after the style of the ancient Scottish cross at Farr, Sutherlandshire, which is illustrated in the standard works on the sculptured stones of Scotland.

Aberdeen, Nov. 16, 1896. HEATHERBLOW.

THE ARCHITECTS OF THE HALL OF HISTORY.

To the Editor of STONE:

DEAR SIR:—Our attention has been called to a paragraph in your November number (p. 562) in the article relating to the Hall of History of the American University at Washington, D. C. This paragraph, entirely unessential to the subject of the article, sets forth that the working drawings furnished by us for the erection of this building did not correspond with the original drawings on which the builders made their estimates; that the discrepancy was called to the attention of the building committee; and that consequently we were "paid off," our services dispensed with, and Mr. W. M. Poindexter, of Washington, whom at the suggestion of the committee we had accepted as associate architect, was then given sole control of the building.

This statement is so gratuitous and unnecessary, so contrary to facts, and so injurious to us that we must ask you to give equal publicity to our statement that our detail drawings were, according to our custom, an exact explanation of the original contract drawings; that we have never had any intimation from any source, until we read this paragraph, that these detail drawings were not in proper workmanlike accord with the drawings on which the final estimates were made; that our withdrawal from this work was proposed by us, was entirely voluntary, was effected after all the work which we had agreed to perform had been performed by us, and was occasioned by circumstances which had nothing to do with the integrity of our professional work, or with any expression of dissatisfaction or distrust on the part of the building committee. On the contrary, when our connection with this work ceased at our request, the committee formally expressed its regret at our retirement and its hope that their reluctant acceptance of our proposition might not interfere with our professional relations with the Uni-

versity in the future. Several members of the committee have volunteered to us through its Secretary their assurances of complete confidence in us as architects and their recognition of our reputation in the profession.

It is humiliating to us to be constrained to make this explanation.

VAN BRUNT & HOWE, Architects,
Kansas City, Mo.

STONE has to say in reference to the article referred to that it was copied *verbatim* from the *Government Advertiser*, Washington, D. C., a publication, we have had every reason to believe, was good authority on all matters concerning contract work at the National capital. Our correspondent's complaint is freely given the same publicity herein as was given the aspersion to which they reply.

STATEMENT FROM THE VICE CHANCELLOR.

OFFICE OF THE AMERICAN UNIVERSITY,
1425 N. Y. AVE., WASHINGTON, D. C.,
November 27, 1896.

To whom it may concern:

A recent item in a certain publication makes it seem but just for me to say that the severance of Messrs. Van Brunt & Howe from their architectural relations to the College of History of the American University was due to difficulty between the associated architects, and was proposed by Messrs. Van Brunt & Howe, and was reluctantly accepted by the authorities of the University.

It did not reflect upon their widely known architectural ability.

SAMUEL L. BEILER, Vice Chancellor.

SERPENTINE.

THIS very interesting mineral is found quite abundantly in the southeastern part of Pennsylvania, forming a belt in some places 2,000 feet wide and of great depth. Joining the gneiss are talc, mica, schist, and the talcos slates, and it is supposed by some geologists that part of the serpentine has been these rock metamorphosed. Then the question arises if the stratified variety was talc, mica, shist, or talco slate, what of the unstratified variety? Is it true serpentine? Real serpentine dykes as in England? Is it sedimentary—a deposit in sea water? Is it intrusive, injected or igneous?

Serpentine is constantly changing, forming other minerals, and is itself formed by the decomposition of other minerals, such as hydrous magnesian silicates, chrysolite, hornblende, enstatite, chlorite, and others. Formed of so many different minerals may account for the difference in serpentine, it never being the same in two localities.

Accompanying serpentine we find a cellular quartz, or honeycomb rock

as it is frequently called, and is considered a surfaee indication of the proximity of serpentine and has been formed by the decomposition of that mineral. Limonite is quite abundant.

Among many minerals occurring with serpentine may be named crystals of chromic iron, magnetite, corrundum, feldspar, garnets and mica.

The soil is naturally very poor unless made richer by the winds or water transporting richer particles of earth. When first mined the stone is soft; it becomes harder and the massive variety is quite extensively used as a building stone in Philadelphia and Chester counties. The Normal school building in West Chester, and a number of prominent buildings in Philadelphia, many of the churches, Academy of Natural Sciences, and the University of Pennsylvania are of this mineral. It is more durable than marble. When too poor for building purposes, it being a hydrous magnesium silicate, it is used in making Epsom salts and preparations of magnesia. It is also used in the manufacture of the metal magnesium which is employed in the production of intense light. The metal is of a silver color and is usually sold in the form of ribbon. All the serpentine is not green like that seen in houses, which are beautiful when new, but the color fades through time and becomes dull. Sometimes it is a beautifully striped and mottled green, white, gray, and yellowish brown. It receives a fine polish and is sometimes classed as marble and is termed either verd-antique, ophicalcite, Irish green, or Mona marble, and is used for making vases, mantelpieces, table-tops, etc. There is an asbestos variety which is used for the same purposes as hornblende or asbestos though quite inferior.

There are a number of varieties with as many names. A translucent variety called precious serpentine sometimes occurs with common serpentine and is used as a gem; then there is a porcelaineous variety, a thin foliated resulting from the alteration of brucite, a silky delicate fibrous, a coarse fibrous, a resin-like, and bowenite of a fine granular texture.

Harriet E. Wilson.

OUR FOREIGN TRADE IN STONES, ETC.

From the summary statement of the finance, commerce and immigration of the United States, corrected to November 2, 1896, we compile the following:

ARTICLES.	SEPTEMBER.				9 MONTHS ENDING SEPTEMBER—			
	1895		1896		1895		1896	
Imports—	Quan.	Values.	Quan.	Values.	Quan.	values.	Quan.	Values.
Cement, Rom., Portland & other hydraulic...lbs	147,979,862	*Dollars* 485 580	117,499,106	*Dollars* 356,739	871,938,397	*Dollars* 2,834,911	842,185,905	*Dollars.* 2,659,.575
Marble, and mfrs. of..	.....	55,904	.....	60,522	.....	617,803	.....	641,646
Stone, & manufactures of, including slate...	....	41,934	.....	44,513	.....	306,970	....	306,440
Total	147,976,862	583,418	117,499.106	461,774	871,938.397	3,759,684	842,185.905	3,607.664
Exports—								
Marble and stone, and manufactures of:								
Unmanufactured	....	5,673	.....	5,388	.....	51,165	....	54,155
Manufactures of—								
Roofing slate.....	....	6,273	.....	48,366	.....	31,718	.....	333,033
All other.....	....	70,726	.....	63 517	.....	644,388	.....	427,681
Total	....	82,672	.....	117,271	.....	727,271	.....	814,874
Cement..... .....bbls	....	.....	1,403	2,398	.....	.....	44,398	68,135
Exports foreign mdse.								
Cement, Rom., Portland & other hydraulic...lbs	578,635	2,080	17,512	79	2,408,589	9,483	3,264,579	12.359
Marble, & mfrs. of.....	....	94	.....	682	.....	955	.....	1,285
Stone, & mfrs. of including slate.....	....	992	.....	236	.....	1,426	.....	7,754
Total.....	578,635	3,166	17,512	987	2,408,.89	11,864	3,264,579	21,398

Merchandise Remaining in Warehouse on September 30, 1895 and 1896, Respectively.

ARTICLES.	September 30—			
	1895.		1896.	
	Quantities.	Values.	Quantities.	Values.
Cement, Roman, Portland, etc.....lbs...	5,576,157	$ 17,372	17,533,151	$ 55,549
Marble and stone, and mnufactures of:				
Marble, and manufactures of	.....	46,673	.....	20,200
Stone, and manufactures of, including slate.....	.....	20	.....	1 080
Total	5,576.157	$ 64.065	17.533.151	$ 76.829

Imported Merchandise entered for Consumption, by leading Articles and Principal Customs Districts, for Year ending June 30, 1896.

ARTICLES AND PRINCIPAL CUSTOMS DISTRICTS	Units of quantity.	Quantities.	Values.	Internal revenue tax.
Dutiable—				
Cement, Roman, Portland and other hydraulic, in barrels, sacks, or other packages (rate of duty, 8 cents per 100 lbs.):				
Total for year.....	.....Pounds.....	1,193,404 320	$3,828 722	$954,723.33
Baltimore, Md.....	... .do.....	186,844,027	425,642	109,474.17
Boston and Charlestown, Mass.....	..... do	103,363,854	329,285	8?,691.06
New York, N. Y.....	.....do.	411,900 615	1,343,312	329,520.49
Philadelphia, Pa.....	..... do.....	100,979,223	308,573	80,783.35
New Orleans, La.....	..... do.....	122,833,445	391.816	98,306.76
San Francisco, Cal.....	.... .do	139,615.907	459,853	111,692.72
Chicago, Ill.....	.....do.....	7 968.740	25,805	6,375.00
St. Louis, Mo.....	.....do.....	992,742	3.976	794.18

"You own a first-class STONE."—*A. Stewart, Victoria, B. C.*

"We know enough about your book to say that it is well worth the money."—*The Crude Stone Co., Cincinnati, O.*

TIMELY TOPICS

The Ohio Sandstone Sensation. The Associated Press report of the formation of a trust that would "embrace practically all the sandstone quarry interests in the United States" (?) was the biggest fake of the autumn season. We believe it originated in the office of the Cleveland *Leader*, which paper has certainly proven its fitness to its title to lead off with absurd sensations. The Chicago *Tribune* accepted the story as a text for another sort of "leader," in which the iniquities of the trust system were righteously and vigorously set forth. Numberless other daily papers padded their space with denunciations of this latest attempt to demoralize, if not totally destroy, an important industry. The *Tribune* thus broke forth:

> The demoralization which has been caused by the profitable and unchecked career of the trusts is shown by the fact that the men who are about engaging in this new lawless enterprise do not hesitate to tell in advance what they are going to do. They feel sure that no law will be enforced against them, and that they can keep on plundering undisturbed as long as they agree among themselves.
>
> The persons who are getting up this latest combine do not announce that they are going to advance prices. They intimate that there will be a saving of ten per cent. in operating expenses, and that that saving will suffice them.
>
> This is the way the originators of nearly all trusts talk at the outset. They declare that they do not intend to raise prices on consumers but to cut down expenses by dismissing superfluous solicitors business agents, clerks, etc., for the operating expenses of three competing concerns are much larger than they would be if those concerns were consolidated.
>
> But this legitimate gain never suffices. It is swallowed up by increased expenses of another kind. The managers of the trust demand and get extravagant salaries. Then the owners of all the concerns which it is not deemed advisable to operate are paid guaranteed profits in excess of what they would have received if they had kept on running.
>
> The sandstone trust proposes to buy up all the small quarries not in the combination. Most of those quarries will be closed. But the trust will feel obliged to make profits heavy enough to compensate it for the capital locked up in idle quarries.
>
> So the trust will commence by advancing prices a little. But the more money it takes in the more it will want. Its rapacity will grow, and it will make heavier demands on the pockets of consumers. The latter will protest, but that will avail them nothing, for the laws made to protect them will not be enforced.

Now, that's straight shooting, but the subject had no object within its range, so to speak. The *Tribune* didn't stop to consider the area of this glorious, but trust-ridden land. It didn't consult handy references for the number of sandstone quarries in operation and lying idle; the annual output of sandstone; the millions of acres yet undeveloped but known to exist—and, most flagrant oversight of all, the senseless statement that the quarrying companies in northern Ohio could form a trust "embracing practically all the sandstone interests in the United States." The Eleventh Census Report enumerates 803 quarries, distributed among 41 states and territories, producing sandstone. STONE'S up-to-date list comprises nearly 1,500 sandstone quarries in this country. The stupidity of the statement referred to is shown by these figures. But, the sandstone of northern Ohio—"Berea," "Euclid," and

it. There's not an item in the entire schedule of our American tariff law that is so manifestly unfair to an important industry, as the present rate on imported granite. The tax on all building stones should be practically prohibitive, because there is absolute abundance of every quality, with few exceptions, as for instance some Italian or Belgian products, to be had here, and most of our rich stone-bearing lands are in a crude and undeveloped state. If we have an "infant industry" at all that needs parental protection it is stone quarrying and manufacturing.

The Bogus Wholesaler and the Retail Dealer. What appears to us to be a movement that should not succeed, is the effort being made to establish a Western Granite Wholesalers' Association. Not particularly for the evil it may do to the wholesale trade in granite, but for the effect it will have in causing trouble for the reputable and responsible retail monument dealer. The latter is between enough fires now. What with being at the peril of a blacklist in event he may have an honest difference with the manufacturer from whom he buys goods, there be added the contingency of loss as a consequence of dealing with "wholesalers" who have nothing but his custom to lose, he is truly unluckily beset. Many, if not all, of these Western wholesalers of granite for monumental work are mere brokers. They do not produce or manufacture. They are not agents for any established firm of quarrymen and manufacturers. They sell on commission, and a commission is easier to pare down than a profit in these days of close margins. We do not say all of them handle their brokerage in that way, but it is a safe conclusion that most curbstone business men do that sort of thing, and the granite broker is probably no exception to the rule. We can see no use for the broker in any branch of the stone industry—except he may be an importer. In that respect he is useful, and, we are pleased to state, most of the firms in that business, so far as we know, are prosperous and reliable.

It is our opinion a retail monument dealer does the best for himself when he places his orders direct with the producer and manufacturer of the goods he sells. He then acts to sustain prices of the manufacturer and his own.

Romance and the Quarries. Many have been the tales we have read of unusual incidents in the history of quarries. A quarry pit seems to be the abode of more mysterious events and the scene of more peculiar freaks of nature than any other spot on, under, within, or above the earth. Now and then we read of them developing gold or silver streaks; or they run into rich deposits of manganese or some other of the most valuable of mineral ores; again, they are "discovered" to possess some rare relics of ante-diluvian origin—pre-historic remains, for which fabulous premiums are advertised—but which we have never known to be paid. But it has been left for the narrator of the wonders of a mushroom farm, recently described as the subterranean heritage of a prosperous quarryman in Michigan, to excel all former romancers in describing wealth-producing holes in the ground. Every practical quarryman knows there is nothing strange in the fact of existing "mushroom" quarries—the hills and valleys everywhere are full of them—but the quarry under consideration is unique and until now, indescribable. Therein are said to be raised "in the dark" of absolute blackness, every day in the year

a harvest, tons of mellow mushrooms, none of your toadstool variety, but the genus *agaricus*, with flesh-colored *pileus*, warranted the finest goods grown anywhere, and which rapacious market-men snap up at one dollar a pound. The owner of this priceless property has twenty acres of mushroom bearing soil in the winding galleries of his underground farm, all under a high state of cultivation. The queerest thing about the whole story is the statement that the quarryman at the same time keeps "crews of miners" busy blasting out rock to be worked into building material. Think of the shortsightedness of a quarryman producing rock at a dollar or two a ton, when he can produce mushrooms that bring $2,000 a ton, and the supply and demand unlimited! Who would want a gold mine, if he could own a mushroom quarry that was not a "mushroom" quarry?

Georgia Marble Deposit. There is Georgia marble in abundance and of superior quality, but the statement being quoted everywhere as the utterance of one who is in the lead of those who produce it, "that if all the houses on the American continent were destroyed, so inexhaustible is the supply that they could every one, large and small, be rebuilt out of it," is so preposterous that it is astonishing it has had such general publicity. While there are several counties in Georgia producing marble, the "Georgia marble" fit for building purposes is mainly confined to one not very extensive county. We would not even undertake to guess at the number of houses on the American continent; we might, if the subject were worth it, compute the number of cubic feet of marble in a measured area of land, going several hundred feet in depth, and our product would, by deduction, as it must superficially, at once convince anybody that the quantity thus determined would not rebuild the houses of but a small portion of the United States, let alone the barns, chicken-coops, corn-cribs, etc., etc., that dot the landscape of the American continent as thickly as pit-marks on the face of a Georgia "cracker."

Personal Liberty and the Smoker. A newspaper report says the granite-cutters' union has decided to fine any member caught smoking non-union cigars. Just how the walking delegate can determine whether the cigar being smoked by the member was made by a non-unionist, is somewhat perplexing, without the confession of the dealer, or the smoker bought it as such. Most cigars are alike in appearance before they are lighted, and all are alike after being smoked a short time. Hence, if size and complexion are lost criterions, only the odor remains by which the delicate nostrils of the detective may determine the quality of cigar it is; but by what sort of hocus-pocus is he to arrive at a sound conclusion of its character in a trades-union sense? Probably the best test would be to tender a complimentary cigar to the delegate. An acceptance would carry the presumption of its legitimate character, in a union sense. If one is not tendered the presumption logically follows that the smoker would be a fit subject for the scab-list.

SELECTED MISCELLANY.

THE GROWING USE OF GAS AND OIL ENGINES.

GAS and oil engines find a constantly widening field of usefulness. Among the latest appliances are those to mine hoisting and mine haulage, and for both services designs have been put on the market which will probably help a good deal toward still further popularizing engines of this class. For hoisting work particularly, and especially in the case of small mines where the hand windlass or the horse-power machine will no longer give satisfaction, the gas or oil motor offers a number of advantages worth considering, among them the stereotyped, but none the less important, one of fuel convenience. The water supply question, also is easily disposed of, since the same water—and a small quantity, too—can be satisfactorily used over and over again to cool the engine, while its quality needs no consideration so long as it will not badly corrode the iron. With the scarcity of even fairly good water, that is experienced in many mine localities, this feature of the gas or oil engine outfit will be specially appreciated.

In connection with this it is worth noting that for pumping water gas engines have been employed for at least a dozen years, having been installed in a number of German towns for municipal supply as long ago as 1884. From all that can be learned these engines have given satisfactory service. In some of the plants they are used as adjuncts to steam engines to supply any emergency demand, but in most of them they do the whole work of providing for the towns. Outside of Germany little, if indeed anything, has been accomplished in this line, and yet it is not unreasonable to expect that in a few years gas, gasoline and oil engines for waterworks pumping duty will have lost a good deal of their novelty.—*Cassier's Magazine for December.*

OUR EARLIEST CURRENCY.

IT was not until about forty years after the settlement at Plymouth that the English colonists in America felt the need of a coined metallic currency. Few of them had brought much, and what they had was not in demand. For the first ten years exchange of breadstuffs and the usual commodities was active, and almost, as it were, from hands to mouths, while silver was an intrusion and an almost useless incumbrance. Barter was universal in almost every article of household or agricultural use; and there was only satisfaction when, in 1631, corn was made legal tender for debts in Massachusetts.

Yet another medium of exchange had already come somewhat into use, which for twenty years following was the most acceptable currency from the St. Lawrence to the Chesapeake. This was wampum, or peage, the currency of the aborigines, made of the inner whorls of shells (the *carica*) found on the seashore from Cape Cod to Virginia. The colonists for many years desired beaver-skins for the European market, and corn for their own sustenance. The Indians would accept for these a limited quantity of such goods as suited them, but for the balance wanted only their own money—wampum. So the English and Dutch traders sold the shore Indians their goods for wampum. and with it bought peltries from the Indians of the interior. The colonists, sending beaver to Europe, received in return the merchandise they needed. Later, when the trade in beaver fell off, and the products of their own industry increased, they sent to foreign parts fish, whale oil and bone, lumber, wheat, rye,

hard bread, tobacco, turpentine, and horses, receiving besides merchandise much silver and gold coin, especially from the Spanish West Indies. Spain had for many years been drawing great quantities of the precious metals from the rich mines of Mexico and Peru; but this kind of wealth had not yet been discovered anywhere in all America north of the Gulf of Mexico.—*George J. Varney, in December Lippincott's.*

ARCHÆOLOGY OF IRELAND.

SLUMBERING beneath many a peaceful cornfield in Ireland are buried villages which once stood in the heart of the primeval forest, engirdled by the waters of some stagnant peaty lake. The Irish farmer of to-day turns up with his plow the wooden piles upon which these lake dwellings rested; they are black with age, but you can yet trace the mortise holes which the ancient Celt made with his primitive flint chisel.

The archæologist, sniffing such a find, brings along his navvies, with their spades, and presently the buried "crannog" is exposed to daylight. There is a circle in the stockade of piles which kept the artificial islet together. Inside are layers of cross beams, hurdle work, brushwork, clay, peat and other matters, which formed the successive floors of the dwelling, continually renewed, perhaps, as they slowly subsided into the peaty bottom of the lake.

To-day the lake and its waters are represented by a layer of peat, in which these relics lie well preserved, together with samples of the ancient Irishman's knives, chisels and axes—stone, bronze or iron, according to the period of his civilization. The Irish "crannog" was a modification of the lake dwelling of central Europe.

Upon the topic of the lake-dwelling ages, which which were quite prehistoric ages, being practically the same as the ages of stone and bronze, Dr. Munro, the secretary of the Scottish Society of Antiquaries, is a profound authority.

The people who thus elected to keep themselves aloof from their enemies were, according to Dr. Munro, pastoral farmer immigrants from the far east of Europe. They were of a high degree of civilization, for, though their weapons and tools were but of stone or bronze, they could use them well. All together, so far as we can glean any idea of the life led by these prehistoric inhabitants of central Europe, it must have been a fairly quiet and peaceful one, comparing very favorably with modern peasant life. The lake age came to an end when iron found its way into the hands of men—a revolution in its way, said Dr. Munro, far surpassing in its influence on human life any development that either steam or electricity has brought about or is likely to.—*The London Chronicle.*

TOMBS OF EXTRAORDINARY COST.

GREENWOOD Cemetery, says the Brooklyn *Eagle*, will presently be embellished with a number of monuments the like of which cannot be seen in any other American cemetery, and, indeed, will be surpassed only by the structures erected over the remains or to the memory of eminent public men. Much is written about funeral pomp and extravagances, and most that is said upon this point is worthy to be heeded, for it is not one family in a hundred that can easily bear the expense of a great funeral. The cold clay has no good of the ceremonies enacted over it, the prolonging of words and formalities intensifies grief rather than allays it, and the retinue of carriages contains many whose presence is but a functionary compliment, since their acquaintance with the deceased was slight. For the expense put into funerals there is no material return.

With the monument it is different, for it is possible to make of this a work of art that shall be enduring and a delight. The Taj Mahai, erected to the memory of an Indian prince's favorite wife, is a wonder that draws travelers from all parts of the world, and that may outlive the names of both occupant and builder. From it architects have been able to gather useful ideas, and so from other famous tombs designs have been appropriated that have beautified the earth, advanced our arts and

employment to the industrious. It is e greater diffusion of wealth that these have come. The old-fashioned country yard held no such mortuary architecture nd in even the quietest of provincial ries to-day. A quaint and simple in- n on a slab of slate, marble or sandstone , and if there was ornament it took the rm of a grinning cherub, a death's head ure seated beneath a willow holding an low we find tombs that are spacious rs, with elaborate tables where fresh are placed, inscriptions in gold on rich- ze or iron grates that recall the tri- of Ghiberti, Quentin Matsys and the old erg workers.

are some who object to perpetuation es that in themselves hold no associa- greatness, and there are a few who bolish all the beauty of mortuary em- for religious reasons. But usually the o protests against such tombs as we are Greenwood has failed of esthetic cul- and sees in the tomb a pile of dollars ght better have been given to somebody especially to himself. He does not that out of this tomb the architect, the the sculptor, the quarryman, the artist l and glass, the gardener will reap ma- dvantage. Indeed, but for the luxuries ch, many of those who live by supply- e luxuries would find it hard to live at

is, perhaps, a need of a higher regard ss in cemetery structures. Occasionally some that are vain and frivolous in con- execution, overloaded with ornament, vaunting in epitaph embodying conceit by color, gilding and extent, dominating the graves of humbler and equally worthy neighbors as a purse-proud strutting man tries to subdue his associates. In fact, we must rely on the extension of good taste to keep in check a movement toward excess in these matters, that might otherwise be carried to a point as funny as we find it in Westminster abbey. There in the multitude of monuments, among some that are in the best of taste, quiet, august and pure, we see admirals and generals swelling themselves in Roman armor to the neck, full-bottomed wigs above that and holding batons or telescopes in their hands, while about them cherubs peer from tons of marble clouds, or sea fights are shown in relief behind the puffy victors. Startling likenesses to skeletons jump from black holes in tombs; people lay on couches decorousiy dying, while angels come down to weep over them, as if lamenting the need of taking them to heaven; statesmen rise on their toes and brandish their arms in impassioned oratory, instead of lying quietly in their places after they are dead, in the fashion of the older kings and cross-legged crusaders. And the verses—the lies in them would shame a modern politician. We have not advanced so far in sculpture in our land as we have in architecture, and these pretentious horrors are to be spared for the present, at least; but for tombs that have splendor of material, grace, solidity, dignity of design and beauty of ornament we can hardly have too many. No matter who it is that lies beneath the pile, he or she will have lived to a purpose thus to have inspired a work of art.

THE DOLMENS OF BRITTANY.

RY interesting lantern lecture was de- ered by Sir John Evans at the recent Association meeting, from slides taken W. A. Herdman in Brittany, on the found in that country. At Carnac, lmens were arranged in long lines and , and in examining the bases traces of e were found and sometimes stone im- s were present. Prof. Boyd Dawkins ed these megalithic remains to form of a series extending over a very long f time. Remains have been found all British Isles which, in the speaker's opinion, probably belonged to the bronze age, and in reply to a question the Professor maintained that the way in which the majority of chambered tombs belonging to the bronze age clustered around dolmens such as Stonehenge was sufficient to assign the latter to that age, and, further, near the dolmens were found quantities of bronze tools and implements. Mr. Arthur Evans said that the dolmens of Brittany formed one link in the chain which had progressed from east to west, an intermediate link between the Iberian and Northern orders. Those in Malta of the cruciform order curiously

recalled the chambers of the earlier long barrows characteristic of the early Neolithic period in Great Britain. It was interesting, as illustrating the early civilization of Ireland, that ornaments which characterized the Irish megalithic chambers of the early metal age were formed on monuments of the stone age in Brittany.

ROPE DRIVING.

IN a paper upon "Rope Driving," before the Institution of Mechanical Engineers, Mr. Abraham Combe, of the Falls Foundry, Belfast, Ireland, gave the history of transmitting power by ropes, stating that its introduction was due to the late Mr. James Combe, who, in 1856, used a leather rope in connection with a grooved pulley with a V-shaped groove. After some experiments it was found that an angle of 45 degrees for the sides of the grooves gave the best results. Mr. Combe states that it was early recognized that it is necessary to proportion properly the diameter of the ropes to the diameter of the pulleys on which they work; and he adopted the following minimum diameters of pulleys for the various sizes of ropes:

1¼	in. dia. rope,	3	ft. dia. pulley;	ratio	1	to	28.8
1½	"	"	"	4	"	"	"	1	"	32.0
1¾	"	"	"	5	"	"	"	1	"	34.3
2	"	"	"	6	"	"	"	1	"	36.0

Experience has shown that the results have not been so satisfactory when ropes of the above sizes have been used on pulleys smaller than the above minimum diameters.

Regarding the amount of power transmitted by ropes the author says that when working under ordinary conditions the following simple bases were taken from which to calculate the power that each of the foregoing sizes of rope would transmit for each 100 revolutions per minute made by the pulley upon which it is working:

Rope	1¼	in. diam.	on a	3-ft.	pulley.	5	H. P.
"	1½	"	"	"	4	"	8	"
"	1¾	"	"	"	5	"	11	"
"	2	"	"	"	6	"	15	"

and for other sizes of pulleys the power transmitted is calculated to be increased in direct proportion to the diameters of the pulleys. When working under the most advantageous conditions, for instance, where the ropes are running horizontally at good speeds with the pulleys at a proper distance apart and with the bottom rope acting as the driver—the above bases may be increased by 20 to 25 per cent. with safety. On the other hand, when the ropes are working under unfavorable conditions, with centers of pulleys too close together or ropes running vertically, these bases must be diminished by 20 to 25 per cent. The exact amount of increase or decrease on these standard bases has to be determined in each individual instance, according to the circumstances under which the ropes are working.

The speed originally adopted as being the most advantageous was about 3,300 feet per minute. This speed has since been far exceeded in many instances, but it is a question whether advantages have been reaped proportionate to the power gained by the increased speeds. On the contrary, the gain of power by increased speed is largely counteracted by loss of power from atmospheric friction and from centrifugal action; and when this loss is taken into account, along with the increased wear and tear on the ropes and bearings, the speed originally adopted, and speeds within certain limits of it, have been found to give the best results.

The relative merits of ropes made of manila and those made of cotton have frequently been discussed; but experience has shown, the author said, that if the pulleys are properly designed and applied, and if the ropes are the proper diameter, good results are obtained, whether the ropes are made of manila or of cotton.

HOW TALC IS QUARRIED.

AT Luzenac, in the upper valley of the Ariege, talc is quarried on an extensive scale in the granite of St. Barthelemy, a mountain 7,700 feet high and about twenty miles from the main chain of the Pyrenees. The quarries, which are situated about two miles from the summit, and 5,900 feet above the sea, are opened in a bedded deposit, included be-

tween micaschist below and lower silurian slates above, which has been followed for about 2,000 yards in a north and south direction, with a dip of about sixty degrees to the east, the thickness varying from 160 to to 1,000 feet, as does also the composition. Masses of limestone and granite, the latter often of considerable size, are frequently found included in the silicate of magnesia, which also contains some alumina.

The best rock is of a brilliant white color and feels greasy to the touch when ground to fine powder. The principal quarry, at Tremouin, is worked in the open, across the direction of the bed, forming two or three terraces, fifty feet high, the surface covering, six to ten feet thick, having been first stripped. The stuff broken is carried by a level, in the bottom of the quarry, driven in the foot wall of the vein to the valley of Axiat, whence it is hauled in bullock wagons about twelve miles to the works of Luzenac, where a water power of ninety horse-power is obtained from the Ariege. The mechanical preparation includes sizing by sleeves, drying in a rotating cylinder furnace, breaking, grinding and sifting.

Nearly the whole of the product is converted into powder, only a small part being made into pencils for marking out work on metal or sold in the lump form. The consumption extends to almost all parts of Europe and America. The principal applications are in soapmaking and perfumery, paper-making and weaving. It also forms an ingredient in wagon grease and is used as an insulator for electric conductors A new preparation, called cupro-statite, made by mixing talc and sulphate of copper, is now being tried with success as an insecticide in vineyards.—*The Coliery Guardian.*

A REFUGE FOR THE DEFEATED POLITICIAN.

THE "largest cave in the world" has been discovered near Hudson, Mo., and what is better still, this wonderful cave has stalactites that are formed of glittering gold. There is no end to the pure onyx in sight, while the numerous streams that flow through the beautiful caverns are filled with many interesting specimens of fish. Explorers are still exploring, and no knowing what they will yet discover. Strange, isn't it?

VALUABLE "FINDS" IN CANADA.

A VALUABLE discovery of stone called corundum, which is akin to emery, has been found in the county of Hastings, Ont. This stone is now imported at a cost of about $80 per ton. Dr. Dawson, director of the geological survey, has reported the discovery to R. W. Scott, acting minister of the interior. Mr. Scott learned that the land upon which the discovery was made belonged to the crown lands, and he therefore had it withdrawn from settlement. It is said that there are other veins of the same stone extending beyond the crown lands.

Mr. Scott has also been notified of another discovery in the Yukon district. Mr. Ogilvie of the geological survey, who is there at present looking into the delimitation of the boundary between Canada and the United States, writes to the minister from Fort Cudahay, reporting large discoveries of gold on Bonanza creek, a branch of the River Klondike, shown on the map as Deer river, which joins the Yukon above Fort Reliance about one hundred miles east of the Canadian boundary. Two hundred claims have already been staked out.

The provincial department of mines of Ontario has received a sample of asbestos found on the line of the Kingston & Pembroke Railway, in South Renfrew. The asbestos is of the hornblende variety, and a test shows it contains .68 or two-thirds of 1 per cent. of water, whereas the asbestos of commerce contains 13 or 14 per cent. When heated and the water is driven out ordinary asbestos will crumble readily, but this sample is not affected by fire.

With the asbestos was sent a sample of soapstone of good quality, and the deposits of this mineral are said to be unlimited.

Our * Patent * Record.

Edited by Edward C. Weaver, Attorney and Counselor, 900 F St., Washington, D. C.

[NOTE.—The editor will mail complete specifications, with drawings, of these or other patents upon receipt of 15 cents. In ordering give number of patent. Other information gladly given.

REPEAL OF PATENTS.

PATENTS and re-issues may sometimes be obtained by fraud, or sometimes may be granted by mistake. Sometimes these facts may avail as a defense in a suit for infringement, but, as a rule, in the few fraudulent patents in existence such ingenuity was displayed by the attorneys that such defense could not be made. The only other way for an individual to secure benefit in the matter of such fraud is, after a successful interference suit, to take steps in equity for the annulment of the fraudulent patent.

A further equity is believed to lie, where patents have been obtained by fraud or mistake with the United States, is the nature of a bill stating the facts, and praying that the letters patent may be annuled. An illustration of this equity is the celebrated Berliner patent now before the Supreme Court, and in which case the equity jurisdiction will be firmly established.

The bill to repeal a patent must be filed for the United States by a United States district attorney in the Circuit Court for his district and must be filed before the expirations of the patent. No citizen can compel the filing of such a bill nor can he control its prosecution. In other words, the right to the individual only arises after a successful interference suit, when, being a patentee, he stands upon the same plane as the patentee by fraud or mistake and is thus in position to ask equitable interference. Unless an individual can secure this advantageous position, an attack upon the fraudulent or erroneous patent can only be made in the name of the people.

STONE-CUTTING MACHINE.

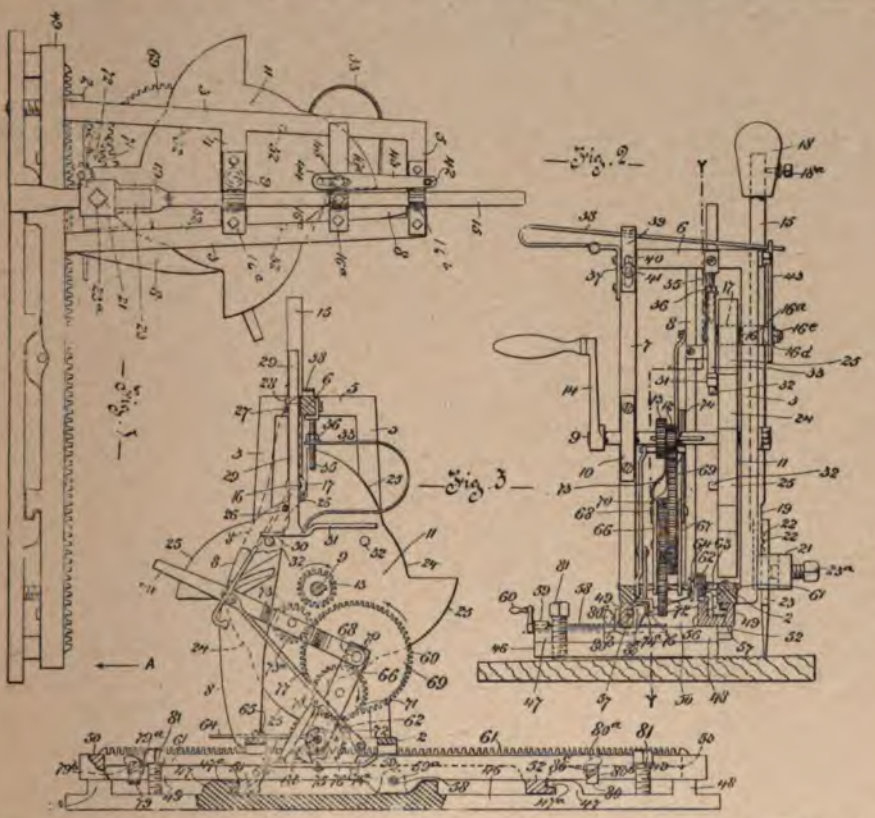
Patent No. 565,468, dated Aug. 11, 1896. Francois Xavier Landry, of Sherbrooke, Canada, assignor of one-half to Jean Baptiste Biron, of Stoke, Canada. Application filed June 22, 1895.

The object of this invention is to provide a power-driven machine that will be capable of doing the work of cutting stones either in dressing, channeling, or any other operation in a more accurate and uniform manner and with greater speed than can be done by hand. The invention may be said to consist in the combination and arrangement of parts set forth, although the construction of such parts may be varied to a considerable extent without departing from the spirit of this invention.

Figure 1 is a front elevation; Fig. 2, an end

evation of the machine, partly in section; and g. 3 a longitudinal vertical sectional view ken on line *y y*, Fig. 2.

To cut the surface of a stone with this achine, the tool is first set in place in the cket of rod 15, the set-screw 16° loosened, the d turned to adjust the edge of the tool to the quired angle, and weights added to the top of e rod to increase the weight or strength of e blow to be delivered, according to the hard-ss of the stone or depth to which it is to be



it. The stops 79 and 80 are then adjusted to distance apart equal to the length of the sur-ce opened upon and the frame moved ward one end, say, the right-hand end, till e rocker 74a is engaged by stop 80, which ill tilt the rocker, and through it and its nnection the gear-wheel 69 will be thrown to mesh with, say, pinion 12. The pinion should then be moved into engagement ith rack 61, when, upon crank 14 being tated, such pinion will be caused, through aft 9, train of gears 69 70 71 72, and shaft 63, to revolve in the necessary direction to cause the carrier-frame to travel in the direction indicated by arrow A. At the same time the wiper-wheel, being rotated with shaft 9, upon which it is rigidly mounted, will be raising the tool and allowing it to drop as the cams 25 and rests 24 alternately come in line with the roller of rod 15. The rotation of the wiper-wheel is made continuously uniform, notwithstanding the ever-varying strain upon it, by means of the spring-actuated T-bar 29 of the equalizing device, already described, bearing upon and resisting the rotation of the wiper-wheel through one of the pin projections 32 thereon, which of course rises as one of the rests 24 is passing the roller of rod 15, and, after such pin projection has pased the vertical, assisting the rotation of the wiper-wheel by bearing upon such pin projection in its downward course while the following cam is raising the tool.

It is obvious that by mounting the stone upon a movable carrier and securing the table

of the machine thereto that the tool carrying and operating mechanism could be stationary and the same work done without changing any of the parts of either the table or the carrier-frame or their relation to one another.

STONE-LEWIS.

Patent No. 560, 329, dated May 19, 1896. James Sherman of Cambridgeborough, Pennsylvania. Application filed January 28, 896.

This invention relates to stone-lewises; and is illustrated in the accompanying drawings as follows: Figure 1 shows the lewis in place (the dotted lines indicating the stone) in a long mortise. AA marks the grip-irons of the lewis. They are formed with

Fig. 1.

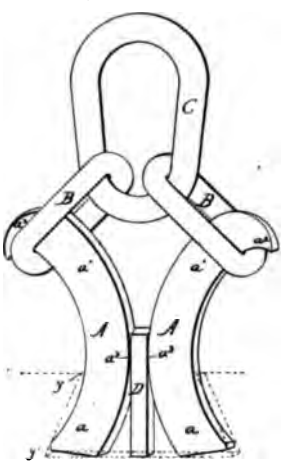
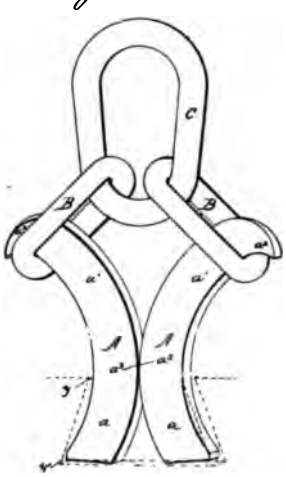


Fig. 2.



the tenons *a* and the extensions a′, having, preferably, the general directions shown. The upper ends of the extensions are provided with hooks a^2, on which are hooked links B B. The links B B loop a central link C, the three forming an inverted toggle-joint, the result of which is to draw together the upper ends of the extensions when the force of the lift is applied. The grip-irons are placed counter to each other and each is counter-fulcrumed by the other on the edge opposite the gripping edge of the tenon. The edges of the grip-iron where fulcrumed, as at a^3 a^3, are curved and form what is termed "rolling fulcrum-surfaces," against which the drawing-together force of the toggle is exerted to effect the spreading of the tenons in the dovetail mortise. By this method of fulcruming the grip-irons the fulcrum can be brought nearer the ends of the tenons than can be effectively done by means of fixed pivots and the full complement of metal at the fulcrum (the vital point) is attained.

It is desirable in these devices to have the tenons contact at both the top and bottom of the dovetail mortise, as at *y y′*, in order that there will be no "playing" or "sawing" of the lewis in the hole. The rolling fulcrum-surface at the point of fulcrum accomplishes this result to some extent, as a greater spread of the tenons is made with less change of angle than is effected with a stationary pivot. Where, however, the variation in the size of the mortise exceeds the capacity for compensation just stated, a spreader D is inserted, as shown in Fig. 1. By having several sizes of spreaders any mortise within the capacity of the lewis can be readily and accurately fitted. The opperation of the device will be readily understood. The grip-irons are placed in the mortise and the links B B placed over the hooks a^2 a^2. The lift-chain is attached to the link C. The effect of the force of the lift is to draw together the extensions *a* and spread the tenons *a*, which are in this manner securely fastened in the stone. The lewis can be readily removed when the pressure from the lift is released.

ATTACHMENT FOR STONE-PLANING MACHINES.

Patent No. 560,871, dated May, 26, 1896 Charles A. Thompson, Newark, New Jersey. Application filed June 8, 1895.

The objects of this invention are to enable curves to be planed upon stone with greater facility, to reduce the space heretofore required in planing such curves, to enable curves of greater radius to be conveniently planed in stones, and to secure other advantages and results, Fig. 1 is a plan of the improved machine. Fig. 2 is a similar view showing the parts in different positions. Fig. 3 illustrates a modification of construction, and Fig. 4 is a vertical

transverse section showing the relation of the parts more clearly.

In said drawings, *a* indicates a suitable bed or frame, upon which is arranged a table *b*, which slides on suitable ways or bearings, forced by a screw-shaft *c* and a belt and pulley *d d'* or other suitable gearing in any manner common in stone cutting or planing machines.

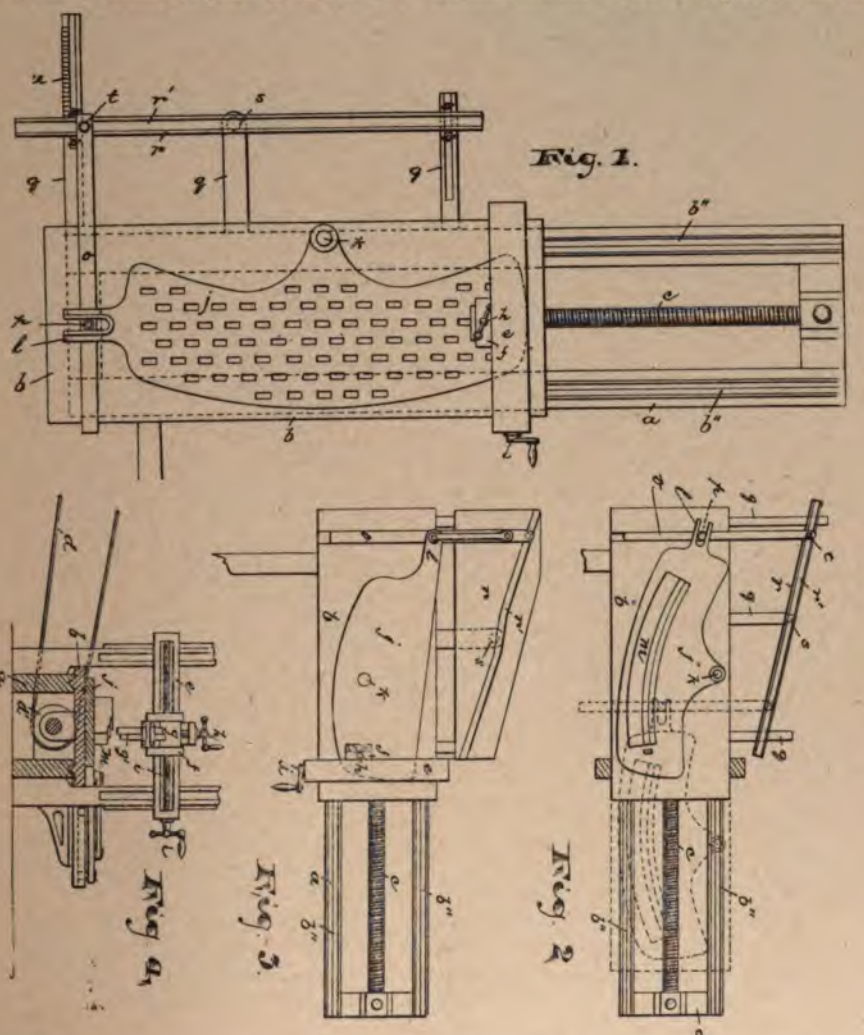


Fig. 1.

Fig. 4.

Fig. 3.

Fig. 2.

Above the table is the usual transverse slide-way *e*, on which are arranged the saddle *f* and tool carrier or holder *g*, which parts are operated by hand-screws *h* and *i*, also in any manner common in the art, *g* indicates the cutter.

Other suitable means for operating the table and adjusting the cutter common in the stone-planing art other than those shown may be employed without departing from the invention.

Heretofore it has been common, in connection with such a sliding table as referred to, to employ means for producing curved lines in stone-cutting; but for various reasons such means have been open to objection, in that in some cases it was necessary to provide a center at a distance from the machine upon which the stone was turned when being planed. This involved the consumption of a large amount of yard-space. The results secured when long radial guide-bars were employed were also imperfect because of the vibrations of the bar and

irregular movements of the block of stone. On arranging the g
jected to the cutter. r parallel with the direction of movement
ods and means provided have the table b when said table and its supplement-
d practical objections—such, for al table j are moved on the ways a, the trans-
in certain cases where the tool verse arm o also moving with said table a, the
angle to the curved line of the roller l will simply travel through the grove r,
se of a straight movement of the without occasioning any secondary movements
straight transverse movement of the but by inclining said bar r more or less to said
the change in the relation of the line or directions of movement of the table a
curved surface being cut tended the bar o is forced to move transversely in the
ce a difference in the effect of the groove of the table a and produce a secondary
edge on the stone. In other cases, movement of the supplemental table j on its
he machines required the interchange pivot or fulcrum. This movement is of course
erns or specific guides to produce the transmitted to the stone m, resting upon the
ons required in ordinary practice, so table. The slot or groove in the arm or exten-
large variety of patterns or guides were sion l, in which the pin or roller p on the
red. These objections and others are transversely-moving bar works, allows the
led by this improved machine; by which pivotal movement of the supplemental table
simply adjusting the guide-bar one may cut and prevents any binding of parts. The great-
the stone curvatures, whose concavities er the inclination of the bar r to the line of
e in opposite directions, curves with radii movement of the table the shorter will be the
various lengths, and should plane surface radius of the curve. By a slight inclination of
e desired he can cut them by simply making said bar a curve of a long radius will be pro-
he required parallel adjustment of the parts. duced.

Again referring to the drawings, j indicates It will be evident that by means of the sta-
a supplementary table, which is pivoted upon tionary cutter (stationary after being properly
the table b at k and is furnished at one end adjusted by the means described) and the piv-
with a slotted arm or extension l and with otally-movable stone said cutter, when once
suitable means on the face thereof whereby the brought to the inclination proper to produce
block of stone m, Fig. 2, is fastened thereon. the desired cutting or planing, will main-
Adjacent to said extension the table b is pro- tain a uniform inclination to the curved line,
vided with a transverse slot or other suitable and the cutter will produce a uniform cutting
ways or bearings for a sliding bar o, which lat- effect and will not "bruise" the stone because
ter is provided with a pin p, preferably having of an improper relation of said tool to said
an anti-friction-roller. Said pin and its roller stone.
work in the slot of the extension l of the sup- In Fig. 2 is shown a variation in the con-
plementary table. Back of the table b, on struction of the invention. Here the guide-bar
suitable bearings of the frame a, such as q q q, is made wider, and the groove therein is not
is a longitudinally-grooved lever r, which is straight, but is more or less irregular to effect
fulcrumed, as at s, and receives a pin and its a desired variation in the curve. Here also is
roller t of the transversely-sliding bar o. shown the supplemental table linked to the
The guide bar or lever r may be adjusted so transversely-movable bar.
s to lie parallel with the line of movement of Other changes may be employed of a me-
the sliding table b or be disposed at various chanical nature without departing from the
angles thereto, the divergencies being either spirit or scope of the invention.
toward one end of the table or the other to
change the curvature, so that the concavity
will face in a reverse direction, if desired.
Means are provided for clamping or fixing
the grooved bar, and its adjustment is facili-
tated by a scale u, Fig. 1, of graduation-marks
upon one of the bearings q of the frame or on
other suitable member of the machine, by
working parts may be adjusted
ired radius upon the

STONE-WORKING MACHINERY.

Patent No. 505,249, dated August 4, 1895. William R. Young, of Brooklyn, New York.

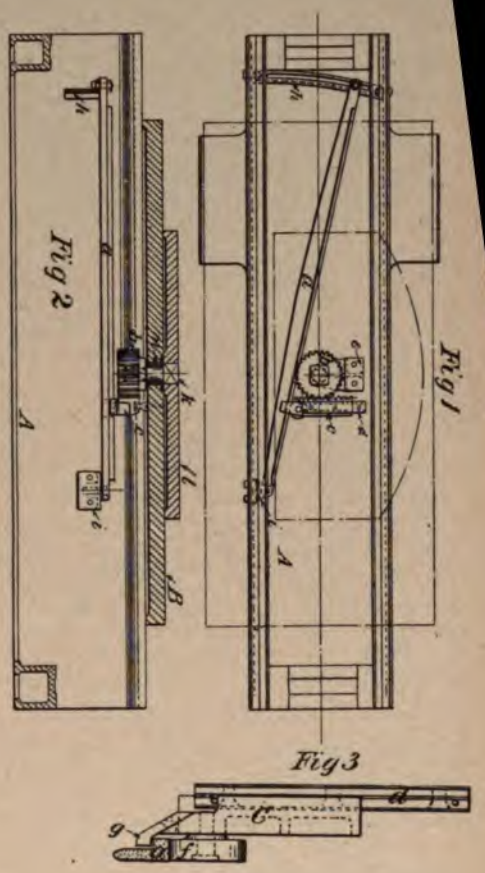
The object of the invention is to provide a new and improved attachment to a stone planer or planing machine whereby stone or other material can be planed to any desired radius. Reference is to be had to the accom-

panying drawings, forming a part of this specification, in which similar letters of reference indicate corresponding parts in all the figures.

Figure 1 is a plan view of the improved attachment-planer platen and attachment-platen shown in faint dot and dash lines. Fig. 2 is a side elevation of the same planer bed and platen shown in section. Fig. 3 is a back view of rack and guides.

On a suitably-constructed frame A are bolted two brackets *i* and *h*, a guide-bar *a* being pivoted on bracket *i* at one end and free to move to any desired part of a slot in bracket *h* at the other end, where it is made fast by a bolt passing through guide-bar *a* and bracket *h* at the desired angle. On a guide *d*, bolted to platen B of planer, slides a rack *c*, with a roller-guide *f* and a slipper-guide *g* attached to guide-bar *a*, as shown in Fig. 3 Meshing into rack *c* is a pinion *b*, supported by a bracket *e* and connected to shaft *k* in a suitable manner. Shaft *k* fits into attachment-platen *l*, has a bearing *m* in planer-platen B, and fits into pinion *b*.

The operation is as follows: When guide-bar *a* is made fast at desired angle, the planer is started and guide-bar *a* causes rack *c* to move back by roller *f* running on inclined plane and causing pinion *b*, which is meshed in it, to revolve, carrying shaft *k* and attachment-platen *l* with it, guide *g* on rack pulling parts back to their original position at return of planer to commencement of new stroke.



METHOD OF TRANSPORTING STONE IN MEXICO.

THE following is taken from a report made by the committee of the Trade and Labor Assembly, of Chicago, which has lately returned from an investigation of the condition of the laboring people in the Republic of Mexico: "In the mines, as well as in a building, the owners or builders endeavored to indroduce modern ladders, but the peon would not use them, fearing to risk his life on the rounds, and when weelbarrows were brought for his use he filled the box of the same and carried the loaded wheelbarrow away on his head. The stone quarries in Mexico are from one to fifty miles away from the cities, but the stone, as fast as quarried or a use has been found for it, is carried on the backs of the peons and burros to the cities. Your committee met one of these peons carrying a stone three by three and one-half feet square and four inches thick, which he was bringing from a quarry nearly twenty miles away. Twenty minutes later we met a number of burros, each carrying two such stones, and learned from the attendants that the peon had left the quarry at the same time as did the burros with their load. I was told that the best Mexican workmen on stone-cutting and carving are paid $3 to $4 a day. Journeymen who are not the best are paid $2 a day. Ordinary workmen in stone-carving get from $1 to $1.50 a day, and apprentices to the trade, 75 cents.

FOR LEASE OR SALE

Meramec Highlands

QUARRIES.

ST. LOUIS CO., MO.

Apply Marcus Bernheimer, Pres.
ST. LOUIS, MO.

Quarries on St. Louis and San Francisco Railroad.
15 MILES FROM ST. LOUIS.

Blue and White Lime Stone.

Fully developed, Ledges uncovered; well equipped with Two Channelers, Steam Drills, Two Saw Gauges, Gates Crusher, Derricks, Lidgerwood Cable Hoist, Plenty of Water, Quarrymen's Quarters.

Unlimited quantity of White Ashler, Blue Steps and Sills also Blue Curbing Stone, of which St. Louis requires a continuous supply.

MERAMEC HIGHLANDS CO.

SITUATIONS WANTED.

Advertisements under this heading inserted for subscribers to STONE *free of charge. Advertiser must send 25 cents to pay postage, if replies are to be addressed in care of* STONE *Rate to non-subscribers, 10 cents per line each insertion.*

SITUATION WANTED—In the cut-stone business as bookkeeper or estimator, by young man thoroughly familiar with plans and details; eight years' experience. Address E. A. DIX, care STONE.

WANTED—Position by an energetic, experienced Salesman to wholesale granite or marble in any part of the United States or Canada. Can furnish references, etc. Address "GRANITE AGENT," 327 Jefferson avenue, Oshkosh, Wis.

SITUATION WANTED—Practical Stone-cutter desires a situation as foreman, or to take charge of any job. A1 linesman; quick in figures; eighteen years experience as foreman. Address H. WATSON, 21 Royal street, Warren, Pa

WANTED.—Graduate of Massachusetts Institute of Technology (Dept of Geology) would like position as assistant to manager or superintendent of quarry, with chance to learn business or engineering parts of trade. MYRON L. FULLER, Brockton, Mass.

WANTED—Position as quarry foreman by a thoroughly competent, practical man, who understands the quarry business and all modern machinery; opening new quarries, setting up derricks, etc. Address "F. and A. M.," care STONE

TO SELL. TO BUY. TO EXCHANGE.

Advertisements inserted in this department for 25 cents per line each insertion.

FOR SALE.—Barnhardt steam shovel. Style B. In good working repair. SERGEANT BLUFFS & SIOUX CITY BRICK CO., Sioux City, Iowa.

FOR SALE.—Red granite quarry. Rich, deep red, stone, free from knots or veins, and is unexcelled for monumental or building purposes. Easily quarried and split Quarry fully equipped with all modern machinery, tools, engines, steam drill, derricks, and railroad track running through entire quarry land where new openings can be made at any time into first-class stone. Address "QUARRY," care of STONE.

FOR SALE—One second-hand Ingersoll channeling machine in first-class order, for sale cheap. Apply to LORD, BOWLER & CO., Cleveland, Ohio.

FOR SALE—Complete rock crushing plant and excellent limestone quarry, 100 feet of rock, no stripping; capacity 350 yards in ten hours; machinery new, facilities ample and complete; reason for selling given in interview; great bargain. Address P. O. Box No. 22, Warsaw, Ill.

FOR SALE—Cheap, a four gang marble mill and quarries, located at Loudon, Tenn. This mill must be sold or leased within the next few months, and the best offer gets the mill. Will sell or lease mill separate from quarries if so desired. Address H. N. GREER, Loudon, Tenn.

For Sale—Second-Hand Machinery,

Comprising Channeling Machines Rock Drills, Rock Crushers, Dump Cars, Hoisting Engines, Air Compressors, Steam Pumps, Pulsometers, Boilers, Etc. Condition guaranteed. Prices very low for cash. All subject to inspection before purchase.

WILLIS SHAW,
506 N. Y. Life Building, Chicago, Ill.

For Sale or Term Lease.

Bass Island Brownstone Quarry, on Bass Island Lake Superior; three miles from Bayfield, Wis.

Well equipped with Tools, Channelers, Steam Hoists, Buildings, Docks, etc. Large amount of stripping done; in all respects ready for immediate output of first-class brownstone. Quarry and stone men are invited to examine properly this fall with reference to output of 1897. GEO. P. LEE, 1003 N. Y. Life Building Chicago, Ill.

SECOND-HAND PLANERS FOR SALE.

60 in. wide, 60 in. high x 25 ft. long, L. W. Pond Planer.
46 in. wide, 36 in. high x 10 ft. long, Wood & Light Planer.
38 in. wide, 38 in. high x 10 ft. long, L. W. Pond Planer.
37 in. wide, 36 in. high x 12 ft. long, New York Steam Engine Co. Planer.
42 in. wide, 42 in. high x 16 ft. long, Niles Tool Works Planer
36 in. wide, 34 in. high x 16 ft. long, L. W. Pond Planer.
30 in. wide, 25 in. high x 7 ft. long, L. W. Pond Planer.
30 in. wide, 24 in. high x 8 ft. long, New Haven Planer.
27 in. wide, 27 in. high x 6 ft. long, Wood Light Planer.
26 in. wide, 26 in. high x 6 ft. long, New York Steam Engine Company Planer.
25 in. wide 25 in. high x 5½ ft. long, Stuebner Planer.
24 in. wide, 24 in. high x 7 ft. long, New Haven Planer.
24 in. wide, 22 in. high x 6 ft. long, Place Planer.
24 in. wide, 20 in. high x 5 ft. long, New Haven Planer.

We also have a lot of CHEAP SECOND-HAND LATHES of all sizes suitable for turning stone or marble pillars, posts, etc., which we can sell very low.

Write us and we will cheerfully give full information.

Prentiss Tool and Supply Co.

MACHINE TOOL DEALERS,

115 Liberty St., NEW YORK.

Chicago Store, 62 and 64 South Canal Street.

Edwards, Macdougal & Co., 180 W. Regent St., GLASGOW, SCOTLAND.

STONE MERCHANTS,

Rough Granite, Syenite, Marble and Sandstone for Building and Monumental purposes. Paving stones. Curbs and Setts for Roadways.

Correspondence Invited.

Wm. Wolstencroft's Sons & Co.

(Frankford)

PHILADELPHIA, PA.

Manufacturers of

PNEUMATIC TOOLS

For Stone-Cutting and Carving on All Kinds of Stone.

We beg to submit the following letter which explains itself:

GEORGE HARDING,
GEORGE J. HARDING,
Counselors at Law.

FRANK S. BUSSER,
Notary Public.

LAW OFFICES OF

Harding & Harding

901 WALNUT ST.

Philadelphia, Nov. 23, 1895.

MESSRS. WM. WOLSTENCROFT'S SONS & CO.,
Frankford, Philadelphia.

Dear Sirs:--We have carefully examined your Pneumatic Tool devices, Patents Nos. 364,081 and 373,746, mentioned in the letters and advertisement of the American Pneumatic Tool Co., of New York, and the opinion of Judge Wheeler in the suit of said company against Robert C. Fisher & Co., mentioned in said letters and advertisement. We have no hesitancy in saying that nothing in said opinion or patents in any way affects your tool, and that no claim having the slightest validity upon either of said patents can be brought against you or those using your tools,

YOUR TOOL IN NO WAY INFRINGES EITHER OF SAID PATENTS and is in no way affected by said patents.

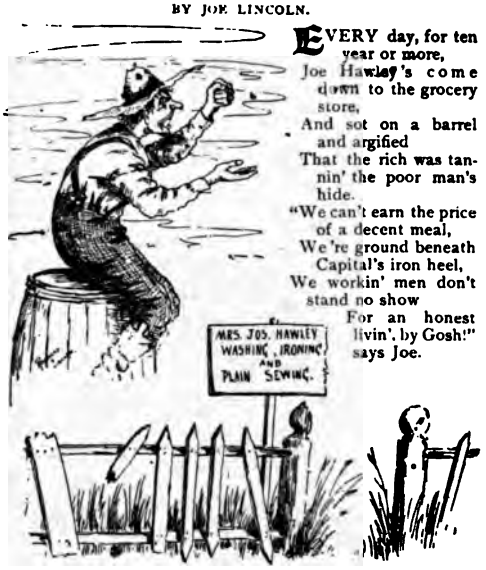
Very Truly,

HARDING & HARDING,

Per George Harding.

AND THERE ARE OTHERS.

BY JOE LINCOLN.



EVERY day, for ten year or more,
Joe Hawley's come down to the grocery store,
And sot on a barrel and argified
That the rich was tannin' the poor man's hide.
"We can't earn the price of a decent meal,
We're ground beneath Capital's iron heel,
We workin' men don't stand no show
For an honest livin', by Gosh!" says Joe.

There ain't a thing that he don't know
About the "Laborin' Class's" woe;
And he'll sit all day and lay down the law,
And only stop to "borrer a chaw,"
While his wife at home, she takes in sewin'
Or goes out washin' to keep things goin'.
For the only work, I ever saw
Joe Hawley do, was to work his jaw.

—*L. A. W. Bulletin.*

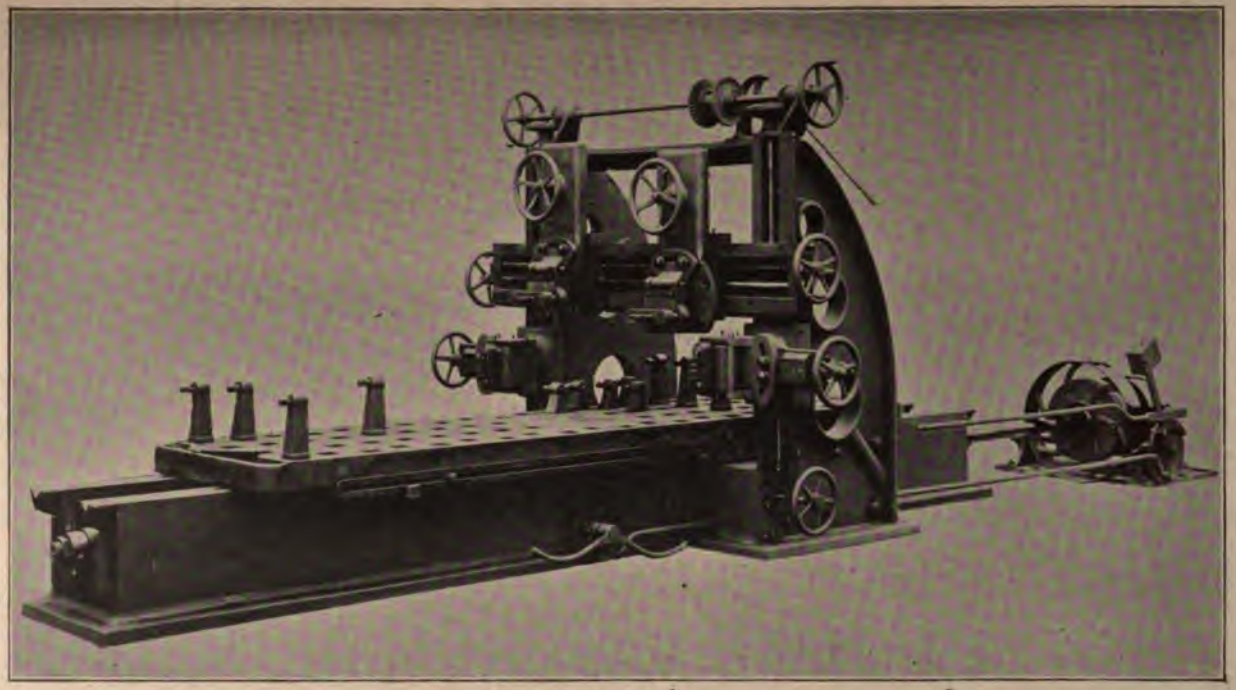
There has been an added impetus given to the quarrying of Washington, Vt., marble recently, and several new investments have been made in the business. Four different parties are now engaged in quarrying, to-wit: Dr. Warner, F. C. Huntington, C. E. Slack and Coffin Bros. The quarries are near the line of the proposed new Copperfield railroad, and the stone will thus be easily marketed.

Col. R. Snowden Andrews, of Baltimore, made an assignment for the benefit of creditors Dec. 4, in consequence of the financial embarassment of the Westham Granite Company of Virginia. Col. Andrews is the president of the company, which executed a deed of trust for the benefit of creditors several weeks ago. He is also the principal owner of the quarries of the company, which are located near Richmond, Va. The company owes between $80,000 and $90,000, which it was unable to pay because of the lack of ready money and the refusal of further accommodation by the banks. This indebtedness is secured by notes indorsed by Col. Andrews, who made the assignment for the protection of all his creditors. Mrs. Mary L. Andrews, wife of Col. Andrews, joined in the deed, which conveys the interest of Col. Andrews in the Westham quarries, land in Florida and property in Baltimore. Henry T. Douglass, of Baltimore, and Charles U. Williams, of Richmond, are the trustees. They bonded for $30,000, double the estimated value of the property in Baltimore, which consists of four lots on North avenue. It is thought the embarassment of Col. Andrews and the company will only be temporary, as the value of the quarry property greatly exceeds the liabilities, having been appraised recently at $500,000. The granite from the quarry has been used by Col. Andrews in paving streets of Baltimore under contract. It has been used in laying what is known as the mosaic pavement.

Joliet, Ill.—A totally unexpected and somewhat sensational point has been made in the trial of the condemnation proceedings of the Chicago Drainage Board against the Northern Trust Company and the Western Stone Company, new in progress in the Circuit Court. This is the case in which a new trial was granted the defendants a few weeks ago by Judge Dibell. It was originally tried last June, the trustees condemning 135 acres of land between Lockport and Joliet. The jury's award was an average of between $140 and $150 an acre. The value of the land for quarry purposes was involved and the judge in awarding a

Screw-Driven Stone Planers.

Gangs, Rub-Beds.



Derricks, Hoisters, Etc.

F. R. PATCH MFG. CO.

Send for Catalogue.

RUTLAND, VERMONT, U. S. A.

new trial said the price was too low. The jury in the present suit was obtained and just as the evidence was about to begin the defense filed several affidavits in which it was asserted the Drainage Board was illegally endeavoring to condemn land for the purpose of creating and acquiring valuable water power, contrary to the statutes. Attached to one of the affidavits was a clipping from a Chicago newspaper containing a statement by President Eckhart, in which that gentleman sets forth the probable development of a water power worth from $150,000 to $200,000 per annum to the city of Chicago. The question whether or not the judge should recognize the matters alleged in the affidavits and call for proofs and evidence to determine the right of the Drainage Board to condemn all the land sought to be taken in the suit came up. The preliminary points were thoroughly argued. The defense insisted on the court's recognizing their affidavits, while the Drainage Board's attorneys contended the affidavits were too late, that the Board wanted all this land for legitimate purposes and that the whole proceedings were in fact based on a newspaper report, not known to be reliable.

In an elaborate opinion Judge Dibell refused to entertain the objections filed by the Western Stone Company and the Northern Trust Company. A gist of the refusal to entertain these objections is that they come too late.

The laws of New York require that stone used in buildings erected by state or municipalities shall be dressed within the borders of the state. Complaint has been made by a labor organization that the stone used in the construction of the Eastern Reformatory in Ulster county is sawed in small blocks at the quarry in Ohio. Attorney-General Hancock has given an opinion on the matter. He says that he does not believe that the statute of prohibition includes dressing of that character. The intention is to protect stone-cutting labor in this state and he does not see how the sawing of stone by machinery without the state violates the statute. A similar complaint was made relative to the stone used in the erection of the new jail.

A committee from the Building Trades Council called at the new Chicago Public Library building and ordered the men at work out on a strike. The men refused to obey, much to the surprise of the labor leaders. The manager of the marble company, contractors for the building, laid off six men. The walking delegates of the Marble Setters' Union claimed that the men were laid off because they had taken part in the recent strike on the building, which was settled by arbitration. Manager denied the charge, and offered to restore the men to their old places and let the walking delegates select six other men to be dropped. He declared that his force of men was too large, and that he found it necessary to cut it down by letting six men go. He did not care who the men were, as long as the force was reduced. The walking delegate was in a quandary, and reported to the Building Trades Council. That organization ordered a strike, and appointed a committee to carry out the order. The committee's mandate was ignored by the workmen, who say they have no grievance against the company, and desire to remain at work.

Salesrooms, 143 LIBERTY ST., NEW YORK.

Mining, Coal Handling, Pile Driving, Bridge Building, Log Hauling, and for General Contractors' Use.

Send for **Illustrated Catalogue** giving full description, etc.

CORRESPONDENCE SOLICITED.

W. A. CROOK & BRO'S CO.,

117-123 Poinier Street.

Newark, N. J.

Improved Electric Hoists, single and double, Patent Friction Drum, compound, geared with brakes and reversible for general Hoisting, Mining Purposes and Suspension Cableways. . . .

Derricks and Hoisting Machines

FOR QUARRYMEN AND CONTRACTORS.

SEND FOR CATALOGUE.

Steam Hoisting Engines.
Horse Power Hoisters.
Hand Power Hoisters.
Derricks
Derrick Irons.
Sheaves and Tackle Blocks.
Rooter Plows.
Centrifugal Pumps.

DOBBIE, STUART & CO.

NIAGARA FALLS, N. Y.

NEW YORK OFFICE:—44 Dey St.

SLATE AND STONE PLANER

HORIZONTAL CABLE WAY.

SLATE SAW MACHINES

Write for Catalogue.

S. FLORY & CO.,

MANUFACTURERS OF

Stationary and Hoisting Engines,

Slate Saws, Planers, Dump Cars, Slate-Dressing Machines and Cable Carriages.

Portable Hoists with Boiler and Fixtures on same base, for Contractors' use, etc.

Estimates furnished on Contracts for Erecting Plants on the Cable System—Incline or Horizontal.

Correspondence Solicited

BANGOR, PA.

BOOKS AND PERIODICALS.

"THE MERRY FIVE," by Penn Shirley, uniform with "Young Master Kirke" Illustrated. Lee & Shepard, publishers, Boston. Price 75 cents.

In this second volume of "The Silver Gate Series" the Rowe family continue their sojourn on the Pacific coast, and "The Merry Five," consisting of Molly, Kirke, and Weezy Rowe, and their twin comrades, Paul and Pauline Bradstreet, continue their excursions and adventures amid the novel scenes and strange surroundings of their new home. They go to the beaches, learn to swim, camp out, visit the bee ranch and the mines, everywhere getting new experiences. As in all Penn Shirley's stories, there is the element of funny incidents, and the children will be delighted with all the characters in this wholesome story.

"Heaven and earth shall pass away, but my words shall not pass away." As they have lived and wrought, so they will live and work. From the teacher's chair and from the pastor's pulpit; in the humblest hymn that ever mounted to the ear of God from beneath a cottage roof, and in the rich, melodious choir of the noblest cathedral, "their sound is gone out into all lands and their words into the ends of the world." Nor here alone but in a thousand silent and unsuspected forms will they unweariedly prosecute their holy office. Who doubts that, times without number, particular portions of Scripture find their way to the human soul as if embassies from on high, each with its own commission of comfort, of guidance, or of warning? What crisis, what trouble, what perplexity of life has failed or can fail to draw from this inexhaustible treasure-house its proper supply? What profession, what position is not daily and hourly enriched by these words which repetition never weakens, which carry with them now, as in the days of their first utterance, the freshness of youth and immortality? When the solitary student opens all his heart to drink them in, they will reward his toil. And in forms yet more hidden and withdrawn, in the retirement of the chamber, in the stillness of the night season, upon the bed of sickness, and in the face of death, the Bible will be there, its several words how often winged with their several and special messages, to heal and to soothe, to uplift and uphold, to invigorate and stir. Nay, more, perhaps, than this; amid the crowds of the court, or the forum, or the street, or the market place, when every thought of every soul seems to be set upon the excitements of ambition, or of business, or of pleasure, there too, even there, the still small voice of the Holy Bible will be heard, and the soul, aided by some blessed word, may find wings like a dove, may flee away and be at rest.—*William E. Gladstone, in "The People's Bible History;" The Henry O. Shepard Company, Chicago, Publishers.*

The December *Arena* is a brilliant number. It opens with a well written and eminently sensible article on "The Relation of Art to Religion," by the widely known sculptor, William Ordway Partridge, and closes with another of Will Allen Dromgoole's inimitable short stories entitled "Sweet 'Laases," in which, as usual, the humor and pathos are deliciously blended. Within these limits are to be found valuable papers on a great variety of subjects, in proof of which it is sufficient to cite merely the names of some of their writers: Prof. Frank Parsons of Boston University School of Law, Edward Everett Hale, D. D., Mary A. Livermore, Lilian Whiting, Camille Flammarion, the great French astronomer, Eltweed

POWER FROM GASOLINE? YES. It's very Economical, Simple, Safe and Reliable, *and Weber Gasoline Engines require no engineer. His salary goes in your pocket. For information address*

WEBER GAS & GASOLINE ENGINE CO.,
403 S. W. Boul., Kansas City, Mo.

VULCAN STEAM SHOVELS

Received Highest Award at World's Fair.

VULCAN IRON WORKS CO., TOLEDO, O

QUARRYING AND CONTRACTING Machinery.

CATALOGUE ...ON... APPLICATION.

ST. PAUL, MINN.
CHICAGO, ILL.
CINCINNATI, OHIO.
NEW YORK, N. Y.

AMERICAN HOIST AND DERRICK COMPANY.

CHICAGO—60 S. Canal St. **ST. PAUL, MINN.** CINCINNATI—Carew Bldg.
NEW YORK—Havemeyer Building.

Gasoline Engines....

For pumping water from quarries this is the best, most reliable and cheapest engine. *Catalogue free.*

The VAN DUZEN GASOLINE ENGINE CO., Cincinnati, O.

Stone and Marble Cutters' Mallets

J. B. HELLENBERG,
Coldwater, Mich.

Our mallets are giving splendid satisfaction on all kinds of Stone and Marble. Strictly first-class second growth hickory. Write us for prices, etc.

Send your name for a Souvenir of the Works of Eugene Field,

FIELD FLOWERS

The Eugene Field Monument Souvenir

The most beautiful Art Production of the century. "A small bunch of the most fragrant of blossoms gathered from the broad acres of Eugene Field's Farm of Love." Contains a selection of the most beautiful of the poems of Eugene Field. Handsomely illustrated by thirty-five of the world's greatest artists as their contribution to the Monument Fund. But for the noble contributions of the great artists this book could not have been manufactured for $7.00. For sale at book stores, or sent prepaid on receipt of $1.10. The love offering to the Child's Poet Laureate, published by the Committee to create a fund to build the Monument and to care for the family of the beloved poet.

Eugene Field Monument Souvenir Fund,
180 Monroe Street, Chicago, Ill.

Pomeroy, B. O. Flower, Ellen M. Henrotin, etc. Camille Flammarion contributes a psychical romance of great interest, entitled, "A Celestial Love." There are two fine portraits of William Morris and Rev. E. A. Horton.

"TECUMSEH'S YOUNG BRAVES," by Everett T. Tomlinson, author of "Search for Andrew Field," "Boy Soldiers of 1812," "Boy Officers of 1812," etc. Cloth. Illustrated. Being the fourth volume of the War of 1812 series. Lee & Shepard, publishers, Boston. Price $1.50.

Mr. Tomlinson shifts the scene of action, in this new volume in the "War of 1812 Series," taking up the story of the Creek war, bringing his readers into a closer knowledge of one of the bravest of the historical Indian characters. Stories of the Indians, especially that of Tecumseh, have always been of intense interest, and become doubly so when presented in this author's attractive style. His treatment of the Indian story is such that the book can be placed in the hands of our young people without a fear that they will be induced to start for the West to emulate the heroic deeds of Old Tippecanoe and Kit Carson. Not but that the book contains enough exciting incident and adventure to satisfy any one, but it is also true to the history of those stirring times, which has been much neglected hitherto by our story-writers. The lesson conveyed by the story is one which should be impressed upon every young American.

The complete novel in the December issue of *Lippincott's* is "The Chase of an Heiress," by Christian Reid. The scene is in Santo Domingo, a region hitherto unfamiliar to fiction. "The whipping of Uncle Henry" is a tale of Georgia before the war, in that original and effective vein which is peculiar to Will N. Harben. Pauline Shackleford Colyar tells a Thanksgiving story of "Two Old Boys," "How Tommy Saved the Piece," by Livingston B. Morse, records a remarkable event in theatrical annals of the humbler sort. The methods of "Shutting out the Sea" are set forth by George Eihelbert Walsh. D. C. Macdonald writes on "The Land of Taffy, the other name of which is Wales. George J. Varney gives the history of "Our First Silver Mine," and David Bruce Fitzgerald describes "An Old Virginia Fox Hunt." "The Evolution of the Poster" is traced by Agnes Carr Sage from the beginnings of advertising, so far as known. Arthur Inkersley discusses "Anagrams." Jean Wright has a lively essay on "Flirtation as a Fine Art." The poetry of the number is by Elizabeth Crooks, Grace F. Pennypacker, Emma C. Dowd, and Arthur D. F. Randolph.

The *Atlantic Monthly* will publish during the coming season a series of articles surveying the great activities of the nineteenth century, among which will be: "A Century of Exploration"—our knowledge of the earth to-day in contrast with what was known of it a hundred years ago, and the parts now settled contrasted with the parts settled then; "A Century of Social Betterment"—wherein and by how much the condition of the mass of men, aspecially in the United States, is better than it was at the beginning of the century; "The Growth of Religious Liberality"—to what extent and by what means religious opinion has been made more liberal, especially by the institutions of the United States; "The Development of American Nationality"—a review of the events and movements that have profoundly affected our national feeling; an historical answer to the inquiry, What is American Nationality? "The United States among the Nations"—a review of the growth of international relations as they have affected the United States, and the changes of our attitude to other nations.

The publishers of *McClure's Magazine* announce a Christmas number of quite extraordinary quality, both in its reading matter and its pictures. There is to be a richly printed cover, decorated with one of Botticelli's most famous Madonnas, specially redrawn by Henry McCarter; a first reproduction of a Madonna painted by Josephine Wood Colby; a reproduction of a portrait of Washington painted at Valley Forge by Charles Willson Peale, and never before published; reproductions of some famous frescos by Melozza da Forli, in illustration of a Christmas poem by Harriet Prescott Spofford; and some new and especially important views of Palestine, made under the personal direction of the editor of the magazine. In addition to this, every contribution will be fully illustrated, and among the contributors will be Rudyard Kipling, Ian Maclaren, Harriet Prescott Spofford, Frank R. Stockton, Hamlin Garland, Henry Seton Merriman, Cyrus C. Adams of the New York *Sun*, and William Canton, author of "W. V. Her Book."

NEW ENGLAND AGENTS:
Woodrough, Mansfield & Co.,
220 Franklin St., Boston, Mass.

PITTSBURG CRUSHED STEEL COMPANY

LIMITED.

717 GRANT STREET, PITTSBURG, PA.

EASTERN OFFICE:
BILLINGS & JOEL,
124 W. 23d St., New York.

PATENTEES & SOLE MANUFACTURERS OF

Crushed Steel, Steel Emery,

DIAMOND

Putty Powder and Rouge.

THE BEST ABRASIVES KNOWN FOR

Rapid Polishing, Rubbing, Grinding and Sawing of Granite, Marble, Stone, Onyx, Brick, Glass, Metal, Etc., Etc.

B. C. & R. A. TILGHMAN,

1118 to 1126 South 11th-st. - - - PHILADELPHIA, PA.

Patent Chilled-Iron Globules, or

SHOT

For Fast Sawing and Rubbing of Stone.

Original and Standard Material of this Kind. Warranted Superior to all Imitations and Substitutes
Costs Less, Cuts Faster and Wears Longer than Anything Else. A Competitive
Trial with Anything in Cutting Stone Solicited.

SPEED, DURABILITY, ECONOMY, SAVING OF SAW BLADES, REDUCTION OF POWER. OVER TEN YEARS' CONSTANT USE.

Send for circular. See new prices for 1894.

Please mention STONE when you write to advertisers.

VAN DUZEN STEAM JET PUMPS.

THOSE of our readers who are in want of a good cheap pump, one that can be relied upon at all times, and that cannot freeze up nor get out of order and does not cost much money, will do well to give their most favorable consideration to the Van Duzen Steam Jet Pump advertised in our columns. They cost only from $7.00 each up to $75.00 each, and are guaranteed in every case to do the work claimed for them. Thousands of them are in use, and those who have ever tried one will always get additional ones if needed. Messrs. Kinzer & Schaeffer, of Blacksburg, Va., write as follows: "We are using your No. 7 'L' Jet Pumps in our coal mines. We use a 10 H. P. boiler and raise the water 100 feet. It has given entire satisfaction." The firm can show hundreds of letters just like this. A better and more successful oump cannot be found for the money.

A CONTRACT

For twenty-five Air Compressors and twenty-five Air Receivers, of medium and small sizes, has been closed by the Clayton Air Compressor Works, Havemeyer Building, New York, with one company, delivery of the entire order to be made within six months from date. They also report sales of five Air Compressors of standard pattern during the first week in November, and the indications point to a decided revival of trade in Air Compressors, many orders having been held in abeyance, pending the result of the election.

AMERICAN RAILWAY INDEBTEDNESS.

THE railroads of the United States are mortgaged to the extent of about $6,000,000,000, and they have other indebtedness (which it costs them as much or more to carry, and which must sooner or later be covered by bonds) to the extent of nearly $1,000,000,000 more. It must cost them at least $300,000,000 a year to pay interest on their indebtedness. There is no way to escape any of this burden of debt, except through the door of bankruptcy, with the sequel of receiverships and reorganizations. Already, within a few years, a great part of the railway systems of the United States have got rid of portions of their indebtedness by this very process. Otherwise, the total volume of railway bonds mentioned above would be considerably greater than it now stands. At present the railroad companies of the United States are obliged to make each mile of road in

Hawley's Patent Sand Feed

Is used by all the leading firms—saws faster and better than any other sand-feed. More gangs using our feed than any other. Easily kept in order. Also many gangs working satisfactorily, using crushed steel. Can give best of references.

Orders solicited.

E. J. & C. H. HAWLEY MANCHESTER, VT.

QUARRY PUMPS.

CHEAPEST. HANDIEST. SIMPLEST. | PUMPS.

Handling Dirty, Gritty and Sandy Liquids, without Wear, Oil or Care. Pumping outfits for Contractors, Mining, Irrigating, Railroad, Quarry, Drainage and Manufacturing purposes. Second-hand Engines, Boilers, Pumps, and other Machinery always on hand. Exchanging.

MASLINS, 165-167 First St., Jersey City, N.J.

The Publishers' Printing Co.

327 Dearborn Street
CHICAGO

Do all Kinds of

Book and Job Printing

Half-tone work a specialty

☞Send thirty cents in stamps or cash and get a beautifully illustrated Souvenir of "Western Yachts and Yachting."

50 pp. Illustrations
50 pp. Descriptive Matter

STONE and MINING MACHINERY.

Stamp Mills,
Concentrating Machinery,
Smelting Machinery,
Lixivating Machinery,
Cyanide Machinery,
Rock Breakers,
Engines and Boilers

Traveling Cranes,
Derricks,
Derrick Powers,
Planers,
Lathes,
Wire Rope and Fittings,
Rubbing Beds.

Manufactured by

H. H. SCOVILLE & CO.,

CHICAGO,

TELEPHONE MAIN 4805.

250-252-254 South Clinton Street.

A Planer

May be made that will cut stone, but if you wish one that will remove the largest amount of stock in a given time and yet produce a quality of work second to none, it will pay you to investigate the claims of the LINCOLN IRON WORKS, Rutland, Vt.

Their machines are made in four sizes, are strongly and thoroughly built, convenient of operation and durable in use.

A new feature in planers is their double platen machine, which gives practically three machines in one.

A letter to them will bring you further information about these labor-saving devices.

Arithmetic for Stone Dealers.

Calculations Made Easy,
Errors Avoided,
Time and Labor Saved by

Ropp's
COMMERCIAL
CALCULATOR.

The most useful, complete and *practical* work on Figures ever published Specially useful to stone, marble, granite and slate dealers and quarrymen. Nearly every problem in business *already figured out.* Arithmetic made so plain by *original*, short and simple methods, that a child can comprehend it. Worth its weight in gold to young and old. Nearly half a million copies sold. Accompanied by account book, silicate slate, pocket, etc. Bound in elegant leather, pocket size. Address

THE D. H. RANCK PUB. CO., 358 Dearborn St., Chicago.

Sent by Mail on Receipt of Price, $1.

ountry earn and pay interest on an
ed debt of about $40,000—wages and
ating expenses having been met—
thing can be given to the stock-
The obligations to which we have
erring of course do not include the
ous issues of stock, which represent
ership rather than the indebtedness of
ls. It is hardly to be wondered at that
k market has been agitated during these
eeks, and that the common shares of
ys have been selling at the lowest panic
, while bonds and preferred securities,
those listed exceedingly high, have suf-
unheard-of declines. The world of in-
ment and finance is not talking for political
ct. Undoubtedly it is the opinion of a ma-
ity of the ablest railway financiers that the
ection of Mr. Bryan, followed by the with-
awal of gold from circulation and a drop to
ne silver basis, would not only precipitate the
nost fearful panic of the century as its imme-
diate consequence, but would also lead to the
inevitable bankruptcy and complete reorganiza-
tion of the greater part of the railway com-
panies of the United States.—*From "The Progress of the World," in October Review of Reviews.*

Sand Pump

For Feeding Sand, Steel or Shot for

SAWING STONE.

Of all Kinds. Does More Sawing, Uses Less Sand and Water, Requires Less Power and Repairs than any other. Runs only 20 revolutions per minute Pays for itself in Six Months.

FRENIER & LeBLANC, Rutland, Vt.

AGENTS WANTED For the most valuable contribution to the literature of the world since the production of the Bible. The Great Work of the Great Thinkers, Famous Orators, Renowned Scholars, Wise Writers and INVESTIGATORS of the 19th Century.

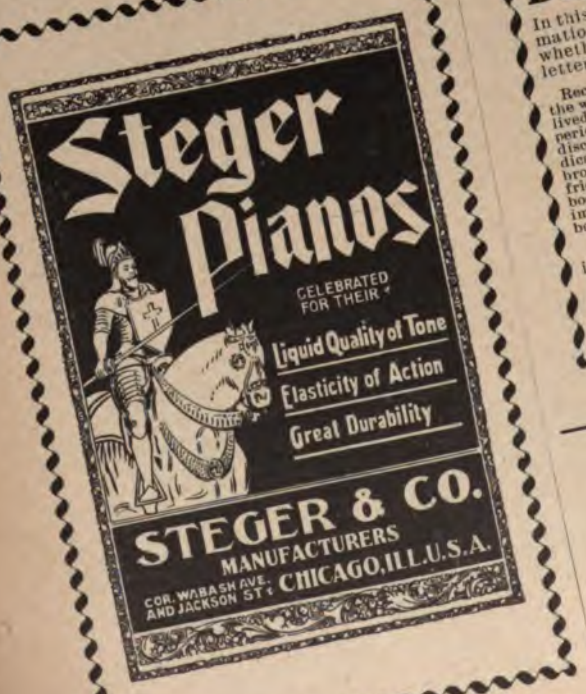
In all the range of literature there is not another book like

THE PEOPLE'S BIBLE HISTORY

In this book alone can be found the information sought by every Bible reader, whether old or young, scholarly or unlettered. It is, indeed, a great work.

Recent discoveries in archæology have brought the world of today face to face with the men who lived, and acted, and wrote during the early periods covered by Biblical Historians. These discoveries have resulted in the triumphant vindication of the sacred volume from the charges brought against it by open foes and pretended friends. Every intelligent person will order the book, as the matter contained in it is of vital importance and cannot be found in any other book on earth.

Write for descriptive and beautifully illustrated pamphlet circular. Address

THE HENRY O. SHEPARD CO.
212-214 Monroe St. CHICAGO.

VANDUZEN STEAM PUMP
THE BEST IN THE WORLD
Pumps Any Kind of Liquid
Always in Order, never Clogs, never freezes. Every Pump Guaranteed
10 SIZES
200 to 12000 Gallons per hour
Cost $7 to $75 each
THE E. W. VANDUZEN CO.
102 to 108 E. Second St., Cincinnati, O.

LIDGERWOOD
Hoisting Engines

Combining All the Latest Improvements,

Also

SUSPENSION CABLEWAYS

For Quarries and General Hoisting Purposes.

LIDGERWOOD MFG. CO.,

96 LIBERTY STREET,

NEW YORK.

Old Colony Bldg., Van Buren and Dearborn Sts., Chicago.
197-203 Congress St., Boston.
40 North First St., Portland, Ore.
61 North Fourth St., St. Louis.
92-94 First Ave., Pittsburgh, Pa.
15 North 7th St., Philadelphia.
21-23 Fremont St., San Francisco.

SALES AGENTS:

FRAZER & CHALMERS, Salt Lake City, Utah, and Helena Montana.
HENDRIE & BOLTHOFF MFG. CO. Denver, Col.
ROBINSON & CARY, St. Paul, Minn.

THE NEW ALBANY M'F'G. CO.

Manufacturers of

Stone Quarry

and

Mill Machinery.

INCLUDING:

Wardwell Double Gang Channelers,
Heavy Derrick Irons and Hoists,
Improved Screw Feed Gang Saws,
Steam or Electric Traveling Cranes.

Bids on Entire New Plants Furnished Free On Application.

NEW ALBANY, IND.

NOTES FROM QUARRY AND SHOP.

Antwerp, N. Y.—The St. Lawrence Marble Company, of Gouverneur, which has been shut down over a year, has decided to resume operations at once, wi.h a full force of one hundred men.

Peter Shaffer, of Mahonington, Pa., an old stone mason, is dying from the effects of inhaling stone dust for many years. He frequently coughs up small bits of coagulated sand.

Directors of the Western Stone Company, Chicago, will meet Dec. 15, at which time it is considered probable that a dividend will be declared. A majority of the board is said to favor such a policy, as the state of the company's finances no longer necessitates the carrying forward of undivided earnings. Recently the last $20,000 of indebtedness was paid off and the balance sheet now shows a surplus of $175,000 available for division. With the prospect of good business ahead it is understood to be the desire of the directors to divide up profits at the end of the current fiscal year and carry forward only a minimum of the surplus.

C. Miller and William Bray are considering the advisability of opening a quarry on their property between the quarries of Jackson Bros. and Stephens, Jackson & Co., at Pen Argyl, Pa. Expert slaters say the cream of the entire slate belt underlies this tract.

C. Miller, president of the Bangor & Portland Railway, also president of three Western railroads, and who besides these heavy duties looks after Hon. J. I. Blair's varied interests in the slate belt, has determined that no less than $50,000 will be spent at the various quarries, in removing rubbish and enlarging the openings. This work will in all probability be begun about the first of the year. It was estimated that with these improvements, and the possible opening of a new quarry, the production of the Blair quarries will be over 15,000 squares a month during next summer. The outlook for better times next year has encouraged these men to determine on the expenditure of this large amount of money.—*Pen Argyl, Pa., Index.*

It is estimated that there are over 3,500 granite-cutters in the New England States. This does not include the common laborers.

The Holliday, Tenn., stone works, employing forty men, have resumed operations.

The proposition of District Commissioners is to start a stone-cutting plant, for which a shed 15x50 feet in dimensions, a brick office and a stable. The location of the establishment is on lots 89 to 92, square 617, on O street northwest, between North Capitol and First streets, Washington, D. C.

The Buffalo, N. Y., granite-cutters report business as dull except in the line of monument work. Few buildings are going up now on which they can secure a job. Some of the men are looking about already for work in other towns. They expect things will look somewhat gloomy here for the craft for some time to come.

The New York branch of the Granite Cutters' National Union held a special meeting recently and discussed the best means to be adopted to see that work upon the state canals was done only by citizens.

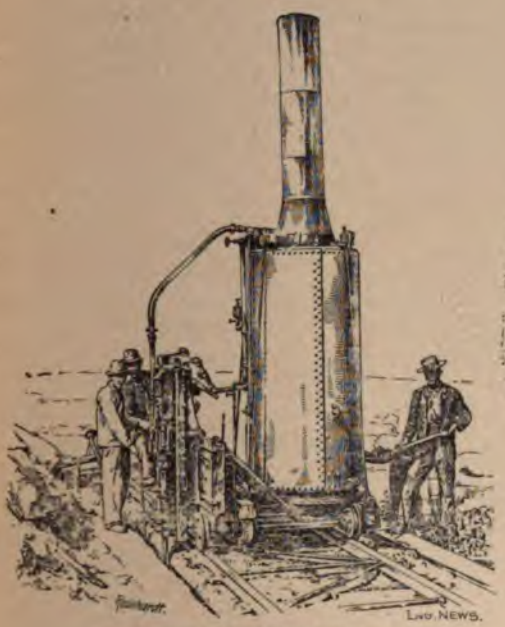
New York.—Attorney-General Hancock at Albany has written an opinion in relation to the allegation by a labor organization in New York City that the contractor erecting the Eastern Reformatory in Ulster county is violating the provisions of the law reqniriug that all stone used on state buildings shall be dressed within the borders of the state, in having stone used in the Reformatory works made in small blocks at the quarry in Ohio. The Attorney-General says he does not believe that the statue of prohibition includes dressing of that character.

The Moosehead Slate Company are talking of starting up their slate quarry at Oakdale, Me., soon.

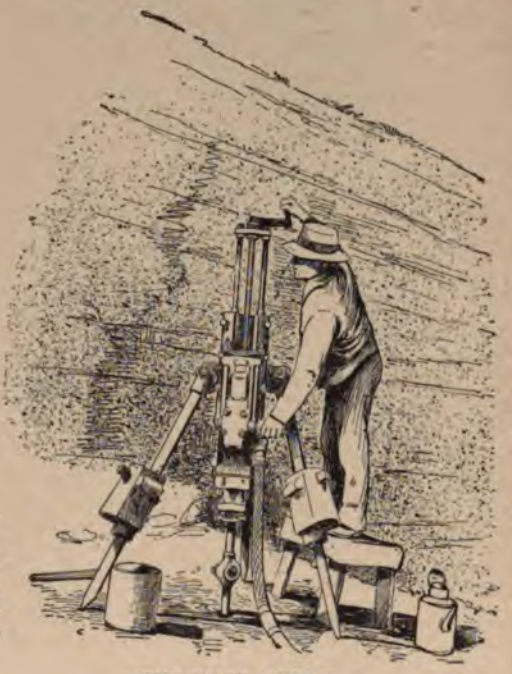
34 INGERSOLL-SERGEANT CHANNELERS.
129 INGERSOLL-SERGEANT ROCK DRILLS.
7 INGERSOLL-SERGEANT AIR COMPRESSORS.

Sold to and used by the Contractors on

The Chicago Drainage Canal.



THE CHANNELER,



THE ROCK DRILL.

Guaranteed to be without an equal in cutting capacity, durability, and economy of operation.
Used on a majority of the rock sections on Chicago Drainage Canal, and by the Romona Oolitic Stone Co Indianapolis, Ind.; Davidson Marble Co, Gouverneur, N. Y.; Maxwell, Rolf & Co., (Sandstone), Cleveland, O., L. B. McCabe & Brother, Texas, Md.; Bedford Quarries Co., Bedford, Ind.; The Piedmont Marble Co., Marietta, Georgia, and many others.

The INGERSOLL-SERGEANT DRILL CO.,

Havemeyer Bldg., 26 Courtland Street, N. Y.

Chicago, Ill., Old Colony Bldg.
Cleveland, O., 26 S. Water St.
St. Louis, Mo., 610 N. Fourth St.
Boston, Mass. 201 Congress St.
Pittsburgh, Pa., 159 First Ave.

Branch Offices:
Birmingham, Ala., 1921 Powell Ave.
Denver, Colo, 1718 California St.
San Francisco, Cal, 13 Fremont St.
Salt Lake City, Utah., 259 Main St.

Butte, Mont., 300 Main St.
Montreal, Can., 164 St. James St
Johannesburg, South Africa.
Sydney, Australia, 187 Clarence St.
London, Eng., 114a Queen Victoria St.

ase mention STONE when you write to advertisers.

Warwick, Pa.—Fox Hill and Pennsylvania quarries, which will give employment to large numbers of men are full of water and not even in working order. Mr. Davis Knauer has practically gone out of the stone business. His son now has charge and he does not employ one-fourth the men his father formerly worked in his extensive operations. The quarry is situated on the Trego property, and known as the Potts quarry, is standing idle and the men cannot get the pay due them for last summer's work. William Nobel is working a few men, but on the whole there is not one-sixth the men employed that were three years ago. By all accounts the outlook for the future is not very promising, and it is likely that this locality will soon be numbered among the "has-beens."

Every one of the boss stone-cutters of Newark, N. J., is now employing none but union men.

Stony Creek, Conn.—Norcross Bros.' granite quarries started up on full time Nov. 30. They have been working fifty men for the last few weeks but will now put on 200 workmen.

The new court house at Ft. Wayne, Ind., will be built of the blue Bedford stone.

The work of enlarging Sibley's stone quarries at Trenton, Mich., is now under progress, and when it is completed employment will be given to about 300 men. The quarry is the only one in this part of the state that produces stone that can be used in the soda ash business, and that industry leads all others in the down river district. The quarry turns out fourteen carloads of stone for J. B. Ford every day, besides its other orders, and when the Solvay Process Co. begin operations that plant alone will require twenty-five carloads of stone every twenty-four hours.

The largest building stones are those used in the cyclopean walls of Baalbec, in Syria, some of which measure sixty-three feet in length by twenty-six in breadth, and are of unknown depth.

Jasper, Minn.—The Jasper redstone quarries shut down Nov. 25, having finished their contracts for this season. About seventy-five men have been employed for the past five months and about 200 cars of stone have been shipped, the principal portion of which has gone to Cherokee, Iowa, to be used in the foundation of the state asylum at that place.

November 4 was the best day ever had in the stone quarry bnsiness at Bedford, Ind. The Monon railway forwardad 102 cars of stone by actual count. The prospects for shipments seems to be better now than since the quarries began operations.

Middletown, Conn.—No manufacturing concern here is expecting an immediate boom, but all are looking for large orders by the end of the month, requiring more hands and full time. In Portland the quarry companies are getting ready for a big rush in the spring. Everywhere confidence is restored and money is easier.

Antwerp, N. Y.—The St. Lawrence Marble Company, of Gouverneur, which has been shut down over a year, has decided to resume operations at once, with a full force of 100 men.

The new Delaware breakwater will be 8,000 feet long. Random stone will be used in large blocks. The width of the top at low water mark will be forty feet. The slope of the sea face will be 1 foot in 13 feet and of the harbor face 1 foot in 1.35. For the substructure the stone will be dumped from scows. The stone for the superstructure above low water mark will be laid evenly to the height of fourteen feet above mean low water. The top of the breakwater will be 10 feet above high water mark. Lighthouses will be erected at the ends of the breakwater. The appropriation for constructing the breakwater is $4,600,000.

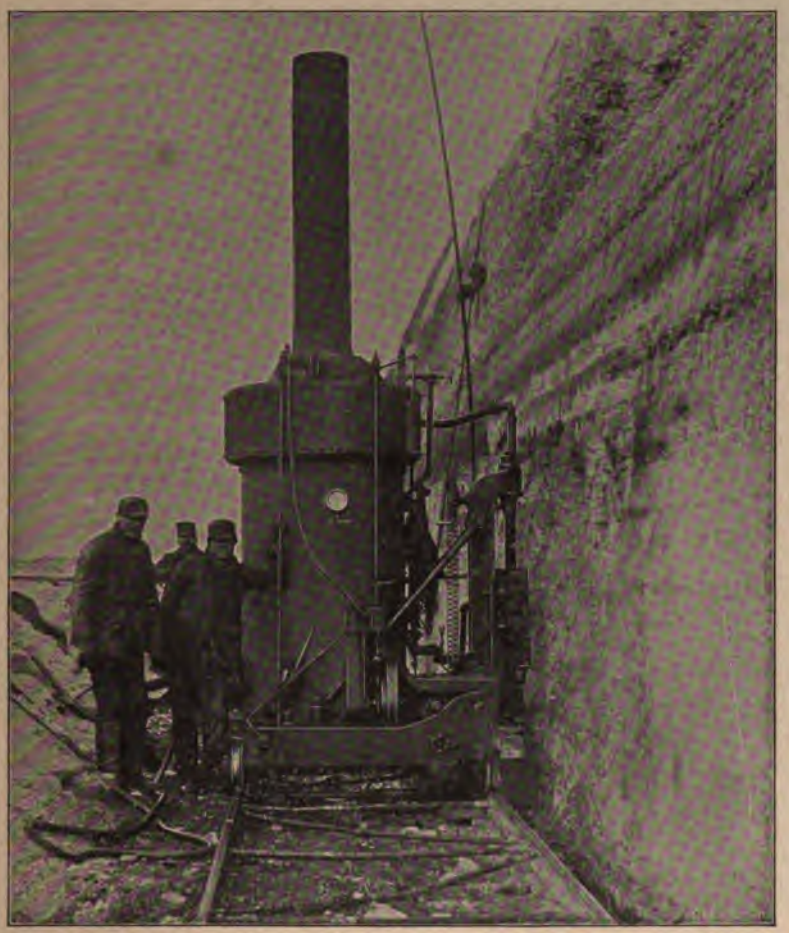
The Portland (Conn.) Feldspar Quarry, which has been leased for a term of years from Brainerd & Gager by Charles Hall, of South Glastonbury, has resumed operations with an increased force.

The Carthage Quarry and Constructing Co., Carthage, Mo., resumed operations Nov. 10, after being shut down for many months. M. F. Viernow, the principal owner and superintendent of the plant was not seen, but it is presumed the plant starts up as a result of the revived business conditions.

At Niantic, Conn., the Rocky Neck quarry has resumed operations to its full capacity. There are large orders ahead, and the quarry will be kept busy all winter.

SULLIVAN

Channelers and Gadders!



THE SULLIVAN CARRIAGE CHANNELER USED ON DRAINAGE CANAL

55	Sullivan	Channelers	in use	on Chicago Drainage Canal.
80	"	"	"	in Vermont Marble Quarries.
27	"	"	"	in Southern Marble Quarries.
20	"	"	"	in Sandstone and Limestone Quarries.
15	"	"	"	in New York Marble Quarries.

ROCK DRILLS of all sizes and for all purposes. DIAMOND CORE DRILLS for testing mineral or quarry lands

Sullivan Machinery Co.,

Main Office, 54 to 60 N. Clinton St., CHICAGO. Eastern Office & Works, CLAREMONT, N. H.

Please Mention STONE when you write to advertisers. xx

The industries about Knoxville, Tenn., seem possessed with a spirit of renewed confidence and prosperity since the election. Groups of politicians and others are no longer seen on the streets, but to-day the entire city seems fired with energy and hustle characteristic of prosperous times. The Tennessee Producers' Marble company has begun with an increased force and will run night and day. The company has received a number of extensive orders recently. The Evans Marble Company increased its force and is receiving orders faster than they can possibly be filled. The Ross Marble Company will increase its force of hands at least one-third so as to fill its orders already received. This is one of the largest marble quarries in the South and its marble is used all over the world.

Davis Bros., proprietors of the Menomonee blue limestone quarry at Lannon, Wis., are putting in a large boiler and engine, an Aultman crusher and a Rand air compressor.

The personal injury suit of William Walter against A. F. Manegold and others for $5,000 damages is being tried in the Superior Court before Judge Austin, Milwaukee, Wis. The plaintiff was employed in the defendant's stone quarries in the town of Wauwatosa. He was engaged in pushing a loaded car up an incline when some of the supports gave way and let the car back on his. He was quite badly injured.

Not a man of those who killed or wounded other men during the Brown Hoisting Co.'s Cleveland, or Berea, Ohio, quarry strikes will have to stand trial. Last Saturday morning the Criminal Court grand jury came in and reported to Judge Logue that it had found the shooting to have been done in self-defense in each case.

Nov. 7 was the monthly pay day of the Western Stone Co., Chicago, and for the first time in many months payment was made in gold. The quarries closed down at that time for the winter and nothing more will be done until after New Year's when it is hoped that stripping may be done for operations next season. Quarry No. 5 may perhaps be operated by a small force during the winter.

Albany, N. Y.—The capitol commission have instructed D. S. Hess & Co., to see that no more marble or other material used by them must be cut either fully or in part outside the state, it having been charged that the firm was using marble cut in Tennessee. This firm is doing the finishing work in the State Library, the comptroller's and treasurer's offices, and in the State Board of Health.

Chicago, Ill.—The H. R. H. Construction Company, 1531 Unity Building, Chicago, is reported to have been awarded the contract for constructing a four-story stone library building for the University of Illinois, at a cost of about $150,000.

Buffalo, N. Y.—Bids were opened Nov. 30 for the construction of the extension of the breakwater in Buffalo harbor. Among those tendering for the work were Messrs. Andrew Onderdonk, Chicago and New York; Hughes Bros. & Bangs, Syracuse; the McArthur Bros. Company, Chicago; National Construction Company, New York; John B. Breymann, Toledo; Chicago Star Contracting and Dredging Company, Chicago; L. P. & J. A. Smith Co., Cleveland, and Christy & Lowe, Chicago, and several local firms. The work is to cost in the neighborhood of $2,000,000, and a bond for $600,000 will have to be deposited by the successful bidder. The bids varied greatly in prices on different work and material. The tender of Hughes Bros. & Bangs, of Syracuse, is said to be the lowest, and there is not much doubt that they will receive the contract for the work. Their bid, as unofficially computed, is $1,763,330 for the entire work. Andrew Onderdonk is second on the list, his tender being $2,091,184. James B. Donnelly, of Buffalo, offers to do the work for $2,110,352. The remainder of the tenders exceed the amount of money appropriated for the work, $2,200,000.

Brattleboro, Vt.—Monumental Marble Works of W. A. Dutton burned. Loss $5,000, owing to damage done to a number of monuments in different stages of development.

Myer & Scoggan, proprietors of the New Castle, Ind., Marble Company, whose place of business was destroyed by fire last week, will at once rebuild on the same site.

Monongahela City, Pa.—Nov. 23 occurr the demise of William M. Gee, senior meml of the firm of R. M. Gee's Sons, of this pla operators of the largest granite and mar works in the Monongahela valley. Mr.

THE WARDWELL

Steam Stone Channeling AND Quarrying Machine

The original and first Stone-Channeling machine ever invented. Will pay for itself in a short time in the reduced cost of getting out stone. *Has no equal for efficiency and economy of operation.*

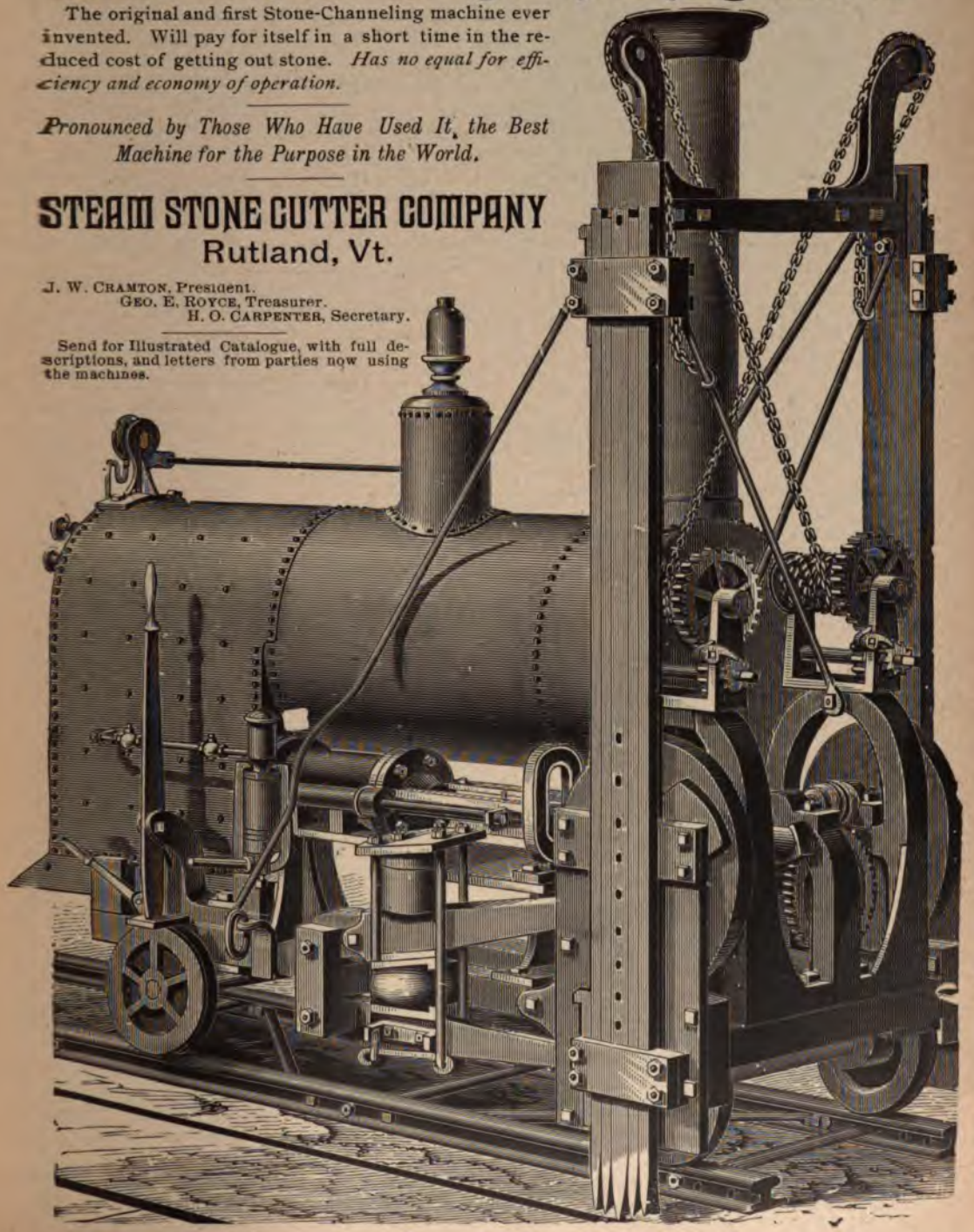
Pronounced by Those Who Have Used It, the Best Machine for the Purpose in the World.

STEAM STONE CUTTER COMPANY

Rutland, Vt.

J. W. CRAMTON, President.
GEO. E. ROYCE, Treasurer.
H. O. CARPENTER, Secretary.

Send for Illustrated Catalogue, with full descriptions, and letters from parties now using the machines.



died at his residence on Fourth street in his 52d year from catarrh of the stomach.

Bluffton, Ind.—J. W. Freeman, one of the most prominent business men of this city, committed suicide Nov. 22 by firing a bullet into his heart. At the time of the deed the suicide was in bed. A few minutes previous to firing the fatal shot Mr. Freeman arose from his bed, procured a revolver from a bureau drawer, and again resumed his place. His wife was aroused by a slight explosion and found that he had fired a 22-caliber bullet directly into his heart, dying within a few minutes. Mr. Freeman has been engaged in the drug and stone quarry business in Bluffton for twenty-five years, and during the last two or three years he has been a deep student of spiritualism and his mental faculties became slightly unbalanced on the subject.

Elkhart, Ind.—Nelson P. Doty, a successful business man, and senior member of the firm of Doty & Tibbitts, monument dealers, died Nov. 28 from bronchitis. He was sixty years old.

Washington, D. C.—The secretary of the treasury has awarded to D. H. Hays, of Chicago, the contract for the stone and brick work, roof covering, interior finish, etc., for the appraiser's warehouse at New York, at his bid of $322,500.

Perry Bros., Andover, N. H., are prospecting for a new granite quarry.

N. S. Allen, West Charleston, Vt., has leased, with right of purchase, the granite on his farm to John M. Hazel & Co., and it is expected a quarry will soon be opened.

The Portland, Conn., feldspar quarry has resumed operations with an increased force, and is erecting a new mill.

The Great Western Marble Company, with a capital stock of $100,000, has been organized at Sedalia, Mo., and the Rev. P. A. Cool, formerly of Pontiac, Ill., is president, Harry Cool, secretary. The Sedalia *Daily Capital* says: "The marble lands in which the company are interested are located in the Cherokee Nation, I. T., and are said to be the richest west of the quarries of Tennessee and Georgia. The lease under which the company is incorporated embraces 8,000 acres and extends for twenty years. The supply seems to be inexhaustible, and very little of it is covered by earth deposits. At the point where the works will be opened it rises as a mountain over three hundred feet above the surface and the cost of quarrying is accordingly reduced to a minimum. The latest improved machinery has been ordered from the East, and it is the expectation to begin active operations within a month."

William Hogan, of Poultney, Vt., has leased to Robert J. Roberts, of Bangor, Pa., a piece of land for the purpose of opening a slate quarry and manufacturing roofing slate. Mr. Roberts will begin operations next spring.

The Hamilton Granite Works, Hamilton, Ont., have assigned to Wm. Anderson.

All the appliances and machinery connected with the J. H. Ransom stone quarry, which is located near Ellwood, Pa., were sold at constable's sale. J. J, Meneice, a resident of Ellwood, bought the articles.

The Hamilton, Ont., firm of Ironside & Davidson, whose business is the manufacture of gravestones and monuments, are in financial straits. They began several years ago, but had only limited capital, and it now turns out that their assets have been mortgaged. They have made an assignment, and it is said they have latterly been unable to pay their employes in full. At a meeting of the creditors, assets were found to be $12,000, and the liabilities $14,000. An arrangement will likely be made with the firm to continue business.

Articles were filed with the Secretary of State of Minnesota on 13th inst., by the Minnesota Sandstone Company of Minneapolis. The Company reduces its capital stock from $250,000 to $100,000.

Avondale, Pa.—The Avondale Marble Company's works at Baker, near here, were sold out Nov. 13 by Sheriff Ingram, of Chester county, on the suit of the Johns Hopkins Oil Company, of Philadelphia, on a claim of about $600. The property was cheaply bought in by representatives of the Avondale Company for $2,253. There were five machines that cost $1,000 apiece, sold for $50 each, and a shifting engine, worth $2,000, was sold for $700. A great many tons of cut marble sold practically for a song. There were wage claims for $8,000 filed with

the sheriff, about half of which were in behalf of the Kennett Square National Bank, which had purchased them. About twenty well known Philadelphians bid on the property.

Clarksburg, W. Va.—Frederick A. Lang, dealer in marble at Clarksburg, has made an assignment. He has been in business since 1874.

J. R. Canty has sold out his marble stock at Gladbrook, Iowa, and is now doing business at Dysart.

D. P. Bagley and C. N. Clark have purchased the interest of D. H. Coffman and A. B. Chance in the marble and granite firm of C. N. Clark & Co., Urbana, Ill. The firm will retain the name of C. N. Clark & Co.

The Fox River Marble and Granite Works is the name of a new company consisting of M. J. Campbell, H. R. Falk and E. N. Raymond, who have purchased the marble works in Kaukauna, Wis., of Adolph Jenss.

S. K. Scrymgeour has closed up his slate business at Monson, Me., and will soon remove to Pennsylvania where he will go into the same business.

Nyack, N. Y.—Fire totally destroyed the New Tompkins Cement Works, in the upper part of Rockland county. Loss, $12,000; insurance, $5,000; cause unknown.

Concord, N. H.—The statement recently published in a Boston paper to the effect that the employment of the state prison convicts upon the manufacture of granite had been discussed at recent meetings of the governor and council, that the matter would be acted upon in the course of a month, and that it is not improbable that the old industry of stone-cutting will be introduced then, has created considerable excitement among stone workmen here and elsewhere in New England. Inquiries develop the fact that the statement is entirely unfounded, and that the subject of granite manufacturing at the prison has not been considered by the executive council. There has been no thought of introducing stone work at the prison.

President Gompers has investigated the charges made by the stone-cutters against the Chicago Federal Labor Union. The members are planer men who are employed in the stone yards in this city. They were refused a charter by the American Federation of Labor at the time of the stone-cutters' strike, the name of the organization proposed at that time being the Planer Men's Union. About two months ago, however, the Trades and Labor Assembly organized the planer men under the name of the Chicago Federal Labor Union, giving it that appellation in order to deceive the officers of the federation. Officers of the stone-cutters' union discovered the trick, and they opposed its admission to the new central body. It is said the charter will be revoked.

Mr. O'Laughlin, who conducts the stone quarry at Ives, Wis., is about to make big improvements at that place. He will plat a section of land, put in macadamized roads, and erect ten or twelve cottages.

The stone-setting contractors, of Chicago, at a meeting decided to withdraw from the Masons' and Builders' Association. Two secret meetings have been held so far and the secession movement had reached such a stage it was decided to elect officers at the next session. Each member was pledged not to give to the press any news regarding the movement.

Plymouth, O,—The Plymouth Stone Company at their quarries are stripping the ground back for a considerable distance east and north of their old excavations and are making great preparations for pushing work next season.

Bloomington, Ind.—John R. East has filed another suit against E. E. Worthington, of the Consolidated Stone Company for damages. This time he demands $1,995, and the case is brought in this court. Mr. East filed a $5,000 suit against Worthington several months ago, and he took it to the U. S. court of Illinois, where East dismissed it. Now, however, the case will be tried in Indiana, as only damages of $2,000 or more can be venued to other states. Mr. East claims damages because of vile and denunciatory language that he alleged Worthington used about him.

Rutland, Vt.—The marble, slate and granite businesses of this region are booming. Large orders are being received daily, and several large dealers from the West, South, and Middle States have arrived to buy stocks for the winter work and trade. Some have purchased more than for the last two years, manifesting confidence in the future of trade. A majority of the

manufacturing companies have paid their employes' October wages in gold.

Ft. Wayne, Ind.—Charles Griebel has entered suit against George W. Park for dissolution of partnership and the appointment of a receiver. The firm has been doing business in the manufacture of tombstones. It is alleged in the complaint that the defendant has stayed away from the business, throwing the responsibility upon Mr. Griebel. W. H. Shambaugh is attorney for the plaintiff. The firm is well known in business circles.

Cleveland, Nov. 26.—Before the beginning of the new year a big corporation, it is said, will be formed embracing practically all the sandstone quarry interests of northern Ohio. The companies that will become part of the new corporation are the Malone Stone Company, quarries at Euclid and Amherst, Ohio; Cleveland Stone Company, quarries at Berea and Amherst; Forest City Stone Company, quarries at Euclid and Columbia Center, Ohio; Mussey Stone Company, quarries at Elyria and Amherst, Ohio; Elyria Stone Company, quarries at Grafton, Ohio; Grafton Stone Company, quarries at Grafton, Ohio; Baillie Stone Company, quarries at Berlin Heights, Ohio; Bryant Stone Company, quarries at Elyria, Ohio, and Ohio Stone Company, quarries at Independence, Ohio. A year ago these companies came together and made a price agreement. Previous to that time they had for some time failed to make money, but after the agreement profits became larger. The agreement has been kept, and now it is thought best to solidify it by means of one great corporation. It is estimated that a saving of ten per cent. will be made in operating expenses alone. The capital will be $5,000,000, and the intention is to buy up all the small quarries not in the combination. [The above dispatch appears by authority of Associated Press. It has been officially denied by Secretary Merritt, of the Cleveland Stone Company, and we have denials from several of the companies named. There is no truth in it.—Ed. Stone.]

Portland, Conn.—Negotiations for the consolidation of the Freestone Quarry Company, of Cromwell, which have been pending for some time, were brought to a successful issue Nov. 24, when all the plans were consummated, and interests of the Cromwell company were transferred to the Brainerd, Shaler & Hall Quarry Company and The Middlesex Quarry Company of Portland. The following is an official report of the transaction:

"Cromwell, Conn., Nov. 24, 1896.—A meeting of the directors of The Connecticut Freestone Quarry Company was held this afternoon at their office, at which the old Board of Directors—Robinson Gill, Andrew D. Baird and James McClaren, of Brooklyn, N. Y., and O. W. Mack, of Portland, resigned. The following gentlemen, viz.: John H. Hall of Hartford, Frank Brainerd, Frederick DePeyster and Henry A. Cornwall of Portland, and Henry H. Smith of Middletown were then appointed Directors, as a majority of the stock of the Connecticut Freestone Quarry Company has passed into their hands. Subsequently the new Board elected John H. Hall, president, and Wm. E. Edwards, treasurer. Frank Bliss was retained as secretary. Frederick DePeyster was elected manager in the place of Mr. Mack resigned."

The meaning of this transfer of interests is that The Connecticut Freestone Quarry Company is now controlled by parties in sympathy of the management of The Brainerd, Shaler & Hall Quarry Company and The Middlesex Quarry Company, Messrs. Hall, Brainerd and DePeyster representing the former, and Messrs. Cornwall and Smith the latter. Business has increased so rapidly of late with the Brainerd, Shaler & Hall Quarry Company and The Middlesex Quarry Company that they have considered it advisable to have another quarry which they could operate if necessity required.

Chicago.—The Probst Construction Company made an assignment Nov. 19. The company is one of the largest contracting concerns in the country. Its headquarters are in New York. No statement was filed showing the amount of the liabilities or assets.

The American Institute of Architects has decided that the permanent headquarters of the institute be located in the city of Washington.

St. Louis, Mo.—The St. Louis Crushed Granite Company wants $60,000 damages from the Schneider Granite Company for alleged breach of contract. The petition says that through an arrangement entered into on March 5, 1891, the defendant agreed to deliver to the plaintiff all its output for five years at $2 per ton. In October, 1891, the defendant declined to live up to its agreement, according to the plaintiff's state-

Established, 1831.

WASHBURN & MOEN MANUFACTURING CO.

New York. Worcester, Mass. Pittsburgh. Houston. San Francisco. Philadelphia. Chicago.

Makers of Iron and Steel Wire for all Purposes.

MANUFACTURERS OF WIRE ROPE AND CABLE.

Plow Steel Hoisting Ropes of highest tensile strength and wearing qualities.

Crucible Cast Steel Hoisting and Haulage Ropes, fine and coarse wires, possessing in the greatest degree qualities of toughness, strength and durability.

IRON, STEEL AND GALVANIZED, FOR HOISTING AND GUYS.

Fittings of All Kinds Attached to Ropes when Desired. Prompt Shipments from Stock.

Chicago Office and Warehouse. 107 & 109 LAKE STREET.

Cameron Steam Pumps.

∴ *NO OUTSIDE VALVE GEAR.* ∴

ESPECIALLY ADAPTED FOR QUARRIES.

For Illustrated Catalogue, address

The A. S. CAMERON STEAM PUMP WORKS.

Foot of East 23d St., New York.

The Pulsometer Steam Pump.

The Handiest, Simplest and Most Economical Steam Pump for General Quarrying and Contractors' Purposes.

Used and Highly Recommended by Quarry and Mine Owners and General Contractors.

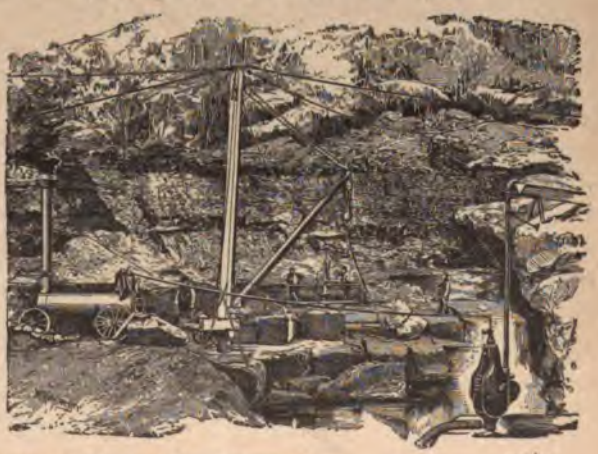
RECENT PRACTICAL IMPROVEMENTS.

MUDDY OR GRITTY LIQUIDS HANDLED WITHOUT WEAR TO THE PUMP.

Descriptive Catalogue and estimate on Complete Pumping Outfit, if desired, furnished on application.

Pulsometer Steam Pump Co.,

13 Greenwich St., New York.



REPRESENTED AND STOCK CARRIED BY

CHAS. W. MELCHER MACHINERY CO., ST. LOUIS, MO.

PARKER, MELCHER & INGRAHAM (Inc.), CHICAGO, ILL.

INGERSOLL-SERGEANT DRILL CO., CLEVELAND OHIO.

Please mention STONE when you write to advertisers.

ment, and the latter claims it is damaged to the amount of the suit.

North American Marble and Onyx Company, Spokane, Wash., $1,000,000 capital stock; trustees, D. M. Drumheller, A. W. Doland, Eugene Denzel, Thomas E. Conlan, Walter Carson, N. Fred Essig, all of Spokane, and Edward Snyder ol Harrisburg, Pa.

Western Granite Company, Chicago; capital stock, $30,000. Incorporators, J. B. Paine, S. W. Bender, and A. F. McCullough.

The Trenton Black Slate Company, Trenton, N. J., filed articles of incorporation. The incorporators are Abram V. Robinson and Lawrence Bardeu, of Trenton, and George A. Westbrook, of Brooklyn. The object of the concern is to dress, ship and market slate. The total capital stock of the company will be $15,000, divided into 150 shares of a par value of $100 each. The company will commence business with a capital of $8,400, subscribed to as follows: A. V. Robinson, $7,600; Lawrence Barden, $400; George A. Westbrook, $400.

The trial of the suit of Henry Mooney against the Belleville Stone Quarry of New Jersey for $40,000 damages was ended in Newark, a verdict for $15,000 being given for Mooney. He was permanently injured in March, 1894, by a stone from a blast while in the employ of the company. He contended that the company did not afford proper protection for its men when blasts were made.

The Gouldsville Granite Company, Northfield, Vt., has gone to the wall. One of the firm has departed, leaving as a reminder a vacuum caused by a few hundred dollars being taken with him, which belonged to the firm. The three or four, who furnished security for the firm, are wearing anxious expressions.

The Wilson stone quarry at Lewisburg, O., has suspended operations.

The big plant of the Sewickley Stone & Brick Company below West Newton, Pa., which until within a few years, was operated by Messrs. W. R. and Henry Funk and A. E. Humphries and James Grantham, was recently sold by order of the court, the purchasers being Messrs. Humphries and Grantham. The stone quarried is of a superior quality, and brick and lime are also manufactured extensively. The price paid for the plant was $15,000. It will immediately be put in operation, with Mr. James Grantham, formerly of West Newton, as Superintendent.

The personal property of the Avondale (Pa.) Marble Company was seized by the sheriff Oct. 23.

John Donaldson, a Brooklyn capitalist and a retired granite contractor, was found dead in bed; death was due to apoplexy.

Mr. Hugh B. Hanna, proprietor of the marble works at 1416 N. Charles street, Baltimore, Md., died suddenly of heart disease. Mr. Hanna was fifty-six years old and a native of Baltimore. He had been in the marble business since 1868.

S. Purdy Barton, a well known resident, died at his home in New Rochelle, N. Y. Mr. Barton was interested for many years in developing the marble quarries in Tuckahoe, but of later years has lived in retirement upon his farm.

D. P. Bagley, of Urbana, Ill., has bought the interests of D. H. Coffman and A. B. Chance in the C. N. Clark marble and granite works. A. B. Chance will be retained as foreman of the works.

The firm of J. H. Healy & Co., Belfast, Me., granite workers, has been dissolved and Mr. Jackson has entered the firm of Hutchins Bros., thus combining the business of the two firms.

The Humboldt Ill., Marble Works are now conducted by Frey & Ennis, Park Ennis having taking interest in the business with Albert Frey.

M. J. Griffin, of Detroit, has purchased an 80-acre tract of land located just north of Omer. Mich., which is rich in limestone. He proposes to quarry the stone at once. The D. & M, railway will put in a spur to connect the quarries with the main line of the new southern extension.

Calais, Me.—The Whidden Granite quarry at Bogbrook has recently been opened by the New Brunswick Red Granite Co. of Maine. A new road to the quarry is in process of construction,

WIRE ROPE

FOR ALL PURPOSES

IRON AND STEEL WIRE OF ALL KINDS WIRE ROPE TRAMWAYS

TRENTON IRON CO.

N.Y. OFFICE
COOPER, HEWITT & CO.
17 BURLING SLIP.

TRENTON, N. J.

CHICAGO OFFICE
MONADNOCK BUILDING.

WATERPROOF
GRAPHITE GREASE
FOR WIRE ROPES, GEARS, ETC.

An unequaled lubricant which will not wash off. It may pay you to send for circulars.

JOS. DIXON CRUCIBLE CO., JERSEY CITY, N. J.

A. LESCHEN & SONS ROPE CO.,

—Manufacturers of—

All genuine Hercules Wire Rope is made with a Red Strand.

Best on Earth.

[Trade Mark Registered.]

920 & 922 N. Main St., ST. LOUIS, MO.

Send for Catalogue. —CHICAGO OFFICE & WAREHOUSE: 19-21 S. CANAL ST.— Correspondence Invited

---

BRODERICK & BASCOM ROPE CO.,

—MANUFACTURERS OF—

AND ALL GRADES OF

Iron and Steel Ropes and Street-Railway Cables,

ST. LOUIS, MO.

which will give an easy access to the river, three-fourths of a mile distant, where there is a fine wharf. A large blacksmith shop has been built. Two derricks have been put up and the manager says 100 men will be at work inside of a week.

The prospects of a granite works being established at Fair St. Andrews Nova Scotia, seems encouraging. Experts have inspected the black granite quarries in the shire town, with a view to establishing a polishing works there.

The Windsor Vt., properties of the Consolidated Granite company have been purchased by a newly organized corporation, the Windsor Green Granite company of Windsor, Vt. The properties consist of green granite quarries on Ascutney mountain, a tract of four hundred acres, where the stone presents itself in perpendicular phases as in the famous Italian marble quarries, showing an inexhaustible supply. Charles H. More of Montpelier is president of the new company, and Walter S. Bigelow of Boston, Mass., the treasurer. The quarries are being thoroughly opened up by a force of twenty men with the help of an effective steam plant.

The Clark quarry at Lincolnville Center, Me., has recently been leased and quite a business is being done in paving cutting, with twenty men employed.

No indictment was found against the members of the granite-cutters' union, of Boston, by the late country grand jury, for conspiracy.

St. Joseph, Mo.—Col. John Doniphan and other pioneer citizens of St. Joseph are at work on a plan to have a suitable monument erected over the grave of the late Governor Robert M. Stewart, whose remains lie in Mount Mora Cemetery.

Hagerstown, Md.—William J. Witzenbacher, attorney for George F. Cochenour, of Washington, entered suit here against Stilson Hutchins, of Washington, for $5,800 claimed to be due for money advanced by Mr. Cochenour in connection with the marble quarry until recently operated at Keedysville, Washington county. Mr. Cochenour sold Mr. Hutchins a five-twelfths interest in the quarry for $2,300. Mr. Hutchins attached the balance on the allegation that he simply loaned the money to Mr. Cochenour, who went ahead and spent $5,800 in developing the quarry, which amount he now sues for.

G. D. Tinsman, of Williamsport, Pa., who purchased all the personal property of the Avondale Marble Company, Avondale, Pa., has paid the sum of $2,123.50 into the hands of Sheriff Ingram. It is probable that the sheriff will in turn pay this sum into court, and that an auditor will be appointed to make distribution of the same among the parties entitled thereto.

Judge Martin has appointed C. F. Norton Commissioner to sell the David Reed quarry property at Bedford, Ind., in a suit in partition brought by the heirs of the estate. The property is valued at $30,000 to $50,000, and Mr. Norton has given $40,000 bond.

In the suit of Lewis B. Sawyer, administrator vs. The Covington (Ky.) Stone and Marble Company, for damages for wrongful death of his intestate, who was killed while at work on the new Mt. Adams school house, the attachment of the defendant's funds will be discharged by giving bond in $5,600.

Mohegan Granite Quarrying Company, of New York, N. Y., with a capital of $10,000. The directors are E. A. Rudger, Poughkeepsie; E. T. Roberts, Sing Sing; J. M. Rudger, Floral Park, L. I.

Camden, N. J.—The Westerly Granite Company. The objects of the corporation are to deal in and sell all kinds of granite and marble. The capital stock of the company is $125,000, and the amount paid in is said to be $1,000. The corporators are Howard K. Wood and George W. Mark, of New York City, and Herbert F. Hatch of East Orange.

Columbus, O.—The Thomas W. Fox Granite Company, of Cincinnati, was incorporated in the office of the Secretary of State by Messrs. Thomas W. Fox, Charles A. Fox, M. M. Fox, M. A. Fox and John W. Herron. They have a capital stock of $50,000.

Trenton, N. J.—The Goat Hill Quarry and Construction Company. The incorporators

ELECTRIC BLASTING

VICTOR ELECTRIC PLATINUM FUSES

Superior to all others for exploding any make of dynamite or blasting powder. Each fuse folded separately and packed in neat paper boxes of 50 each. All tested and warranted. Single and double strength, with any length of wires.

"PULL-UP" BLASTING MACHINE.

The strongest and most powerful machine ever made for Electric Blasting. No. 3 fires 30 holes. No. 4 fires 50 holes. No. 5 fires 100 holes. They are especially adapted for submarine blasting, large railway, quarrying and mining works.

VICTOR BLASTING MACHINE.

No. 1 fires 5 to 8 holes; weighs only 15 pounds, adapted for prospecting, stump blasting, well sinking, etc.

Standard Electric Fuse and Blast Tester, Wire Reels, new design, Leading and Connecting Wire.

—MANUFACTURED ONLY BY—

JAMES MACBETH & CO., No. 128 Maiden Lane, New York City.

Send for catalogue.

GEORGE C. UNDERHILL, RUTLAND, VERMONT.

Specialist in Stone.

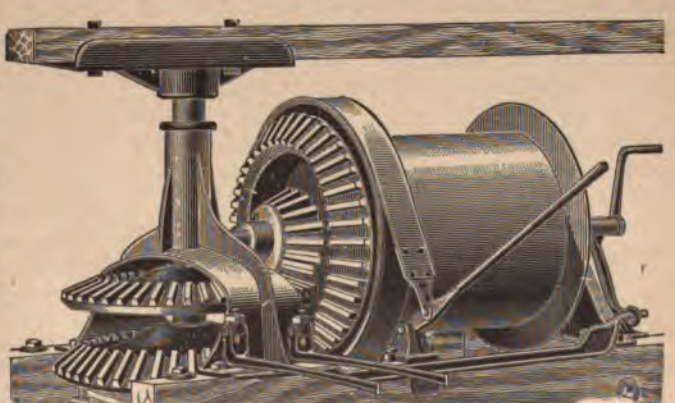
Service in Courts. Examinations and Reports on Marble, Onyx, Dolomite, Talc, Lithograph and other stones. Advice in selecting machinery for quarry, mill or shop; also in marketing, and assisting new concerns to get under way generally.

THE CONTRACTORS' PLANT MFG. CO.,

129 ERIE STREET,
Buffalo, N. Y.

DERRICKS,

Contractors' and Quarrymen's
SUPPLIES.
Horse Power
HOISTING MACHINERY.



are: Levi B. Risdon, ten shares; Albanus K. Worthington, fifteen shares; Edmund R. Willets, A. R. Kuser, O. O. Bowman, Howell C. Stull, Frank M. Weller and John T. Van Cleef, each with five shares. The capital stock is $25,000, and the company is to start with $1,500 paid up. The objects of the company are to quarry and dress rock and construct roads, bridges and other stone work, and own and improve real estate.

Chas. Ewing succeeds Ewing & Portner at Coldwater, Mich., as proprietor of the marble shop, having purchased of the estate the share of the late W. A. Portner in the business.

The firm of Bateman & Laing, that have carried on a monumental shop in Monticello, Iowa, for the past year, have dissolved partnership, J. H. Laing retiring. The business will be carried on at the old stand by the senior member, J. E. Bateman.

Will Goldsbury, Barre, Vt., has sold his granite business to Alexander Marshall.

M. L. Cheney is now proprietor of the Barre (Vt.) Monumental Works, having purchased Mr. Corliss' interest in the same.

A granite quarry is to be opened at Landaff, N. H.

G. L. Torrey, of Cadillac, Mich., will establish monument works at Stephenson, Mich.

Wakefield, Mass.—Fred S. Hartshorne has gone to Onawa, Me., where he and others have recently taken a lease of a slate quarry. The parties intend to develop the quarry and Mr. Hartshorne will remain there for the present. The slate is said to be of extra fine quality.

Mena, Ark. (not a postoffice).—A $100,000 stock company has been organized to develop marble quarries near Mena, on the Kansas City, Pittsburg & Gulf Railroad. A. E. Stilwell, vice-president of the latter company, Kansas City, Mo., can probably give information.

The Waukesha (Wis.) Stone Company has recently closed a contract with the Wisconsin Central Railway Company to furnish 520 car-

THE CONCORD
(Jenny Lind)
Polishing Machine.
MANUFACTURED ONLY BY THE
CONCORD AXLE CO.,
PENACOOK, N. H.
Send for Circular and Price-List.

HOISTING, MINING, BRIDGE ERECTING,
Dock Building, Pile Driving, Coal Hoisting and Quarry Engines
of any power, Sugar Cane transferring engines, transferring machines for depositing cane from car to carrier, with my improved Patent Friction Drums with or without Boilers. Any amount of reference given. Established 1870. Send for Catalogue.

J. S. MUNDY, Newark, N.J. 1744 Market St., Philadelphia, Pa., 22 Light-st. Baltimore, Md., 117 Water-st., Pittsburgh, Pa., 349 S. Jefferson-st., Chicago, Ill., 715 N. Second-st., St. Louis Mo., 39 Magazine.-st. New Orleans, La., 34 Fremont St., San Francisco, Cal., 85 Front-st., Portland Ore., 4th and Wakouta-sts., St. Paul, Minn., 218 Congress-st., Boston, Mass.

Subscribers

Will do us a favor by sending postal card notice when the magazine fails to reach them. The newspaper mails are heavily burdened and consequently slighted by over-worked post office clerks, and often go astray. We will always send duplicate copies.

Not **THE BEST BOOK** that could be made, but

THE BEST BOOK

that is now in print to help

Quarrymen, Stone Contractors, Stone Dealers and Stone Cutters

to get at the *Cubical Contents* of any block of stone that can be measured by a foot rule.

NASH'S EXPEDITIOUS MEASURER.

These firms say this about it:

The Potsdam Red Sandstone Co., Potsdam, N. Y.—"We consider the work a most admirable one."

H. A. Duffy, The Barre Granite Works, Barre, Vt.—"I have used your 'Expeditious Measurer' continually for thirty years, and found the same very valuable in ascertaining the cubic contents of granite, marble and other kinds of stone. I cheerfully recommend it to all dealers in stone. Time is money, and the use of this book saves time."

Columbian Marble Co., Rutland, Vt.—"We find your 'Expeditious Measurer' one of the most useful bookt in our office. It saves time enough to pay its coss every week in the year."

Sheldon Marble Works, New York.—"The 'Expeditious Measurer' is at hand, and its contents fully justifies its title. It should be in the hands of everyone who has any work in stone."

Until we find something better than this work, we shall cheerfully give it the first choice and recommendation.

We sell it postpaid for.....$1.60. Two copies or more in one order..... $1.50 each.

Address **THE D. H. RANCK PUB. CO., 358 Dearborn St., Chicago.**

loads of stone, which will be shipped to Milwaukee, to be used in improvements being made there by the Central company.

The White Lake Granite Company, of Northville, N. Y., has secured a $21,000 contract to furnish a portion of the stone to be used on the Erie canal improvement. The quarry is at White Lake Corners, Oneida county.

Concord, N. H.—Ola Anderson and John Swenson have received a contract for 40,000 feet of granite to be used in the capitol building at Albany, N. Y. The quarrying of the stone will give employment to a large force for several months. It will be cut in Albany, as the laws of New York prohibit the dressing of granite to be used in public works outside the state.

Pittsburg, Pa.—The contract for the new library, music hall and club house building, presented by Andrew Carnegie to the citizens of Homestead was awarded to Wm. Miller & Sons, of this city, for $250,000.

Washington, D. C.—Bids were opened Nov. 20 at the Treasury Department for the erection of the United States Postoffice Building at Saginaw, Mich. Charles W. Gindele, of Chicago, at $67,000 was the lowest bidder.

Canton, O.—The contract for building the annex to the new Knights of Pythias home at Springfield has been awarded to James Devault, of Columbus, for $18,500.

Longview, Texas.—The contract for the erection of the new court house was let a few days ago by the commissioners' court to G. W. Donaghey of Arkansas; $27,450 is the amount it will cost the taxpayers.

Washington, D. C.—The Secretary of the Treasury has awarded to D. H. Hayes, of Chicago, the contract for the stone and brick work, roof covering, interior finish, etc., for the appraisor's warehouse at New York, at his bid of $322,500.

North American Marble and Onyx Company, of Spokane, Wash.; capital, $1,000,000. Incorporators, D. M. Drumheller and others.

JOYCE, CRIDLAND & CO.,
Dayton, O.
Manufacturers of
J. O. JOYCE'S PATENT

Lever, Compound Lever, Screw and Hydraulic Jacks.

Send for catalogue illustrating our
JACKS
For Stone-Yard Use.

Increase your Sawing and Reduce the Cost by Using
"KRUSHITE."
Cuts Faster, Lasts Longer, Gives Better Results than Any Other Material. (See Prices Current.)
A Trial will Demonstrate its Qualities.
FRENIER & LeBLANC, RUTLAND, Vermont.

Our entire plant is devoted solely to the manufacture of
Derricks, Capstans and Polishing Machinery
Write us.
SMITH, WHITCOMB & COOK,
BARRE, VT.

CLASSIFIED DIRECTORY.

LEADING SLATE DEALERS OF THE U. S.

J. R. WILLIAMS & CO., Arvonia, Va.
Manufacturers of and Dealers in the
BUCKINGHAM VIRGINIA PREMIUM SLATE

CHAPMAN SLATE CO.
Chapman Quarries,
PENNSYLVANIA.

EUREKA SLATE QUARRIES, Fair Haven, Vt.
The oldest and largest Unfading Green Slate Quarry in the United States. Producers also of Mottled Green and Purple. A. TUTTLE, Treas.

PENRHYN SLATE CO. 110 E. 17th. St., N. Y. City,
GENERAL SLATE M'F'RS.,
Quarries and Manufactory, Middle Granville, N. Y. *L. E. LEFFORTS, Manager.*

ROBT. A. HALL, Whitehall, New York.
Manufacturer of
RED ROOFING SLATE.
Hearths, Tile, etc., Red and Olive Slate Flour.

DAVID McKENNA, Slatington, Pa.
Manufacturer of
Dark Blue, Unfading ROOFING SLATE.

R. B. PRITCHARD, Middle Granville, N. Y.
Eagle Red Slate Quarry.
RED ROOFING SLATE.
Highest award at World's Fair, Chicago.

NORTH BANGOR SLATE CO., Bangor, Pa.
Miners and mfrs. of the celebrated
BLACK BANGOR ROOFING SLATE.
D. F. More, Superintendant.

LEADING STONE DEALERS OF THE U. S.

H. P. BINSWANGER CO., Cor. 23rd. St., & Madison Ave., N. Y.
Marble, **STONE,** Granite,
Metropolitan Bldg.

WILLIAM MITCHELL, *Quarryman.*
Block and Dimension Stone.
Red Longmeadow. Stone Sawed to Any Thickness.
Address 37 Girard Ave, SPRINGFIELD, MASS.

GOUVERNEUR CUT-STONE CO., Gouverneur, N. Y.
ESTIMATES GIVEN ON ALL BUILDING AND MONUMENTAL WORK.

The New England Brownstone Co.,
CONNECTICUT BROWN FREESTONE.
QUARRY AND OFFICE, *CROMWELL, Middlesex County, Conn.*
W. F. Rauney, Supt. and Genl. Mngr.

The Middlesex Steam Brownstone Co.,
CROMWELL, Middlesex Co., CONNECTICUT,
Contractors in all kinds of building stone. Estimates cheerfully given for all kinds of plain and ornamental work. Connecticut Brownstone sawed to dimensions a specialty.
Geo. J. Grossman, Pres. and Genl. Mngr.

The Middlesex Quarry Co.,
CONNECTICUT
BROWNSTONE.
Portland, Middlesex County, Connecticut.
HENRY A. CORNWALL - Gen.-Mgr.

IT IS THE LAW.

Builder is Entitled to Payment though Work is not According to Contract.—Where a builder alleged that he constructed a house for another, and that the latter accepted, he is entitled to payment according to the value of the work done, although he may not prove the contract as he claimed it to have been, as his right to a quantum meruit inquiry does not depend solely upon the contract, but upon the ground that he rendered service, in work and labor performed, the fruits of which were received by the owner of the building, and the quantity of the material and work and the value of same may be ascertained.—Moffit vs. Glass, Supreme Court, North Carolina, 23 S. E. Reporter, 104.

Effect of Advertisements for Contracts.—Contracts may originate in advertisements addressed to the general public. The intent manifested by an advertisement for bids must govern in its interpretation. Where the advertisement is nothing more than a suggestion to induce offers of a contract by others, it imposes of itself no liability. An advertisement for bids for the erection of a public school building declared that the board reserved the right to reject any or all bids. It was a rule of the board, however, that all contracts should be let "to the lowest and best bidder." A contractor submitted a bid, which was the lowest, for the erection of the building, but the board awarded the work to another. It was held that he had no cause of action, even if the board acted "arbitrarily and capriciously and through favoritism," in awarding the contract.—Anderson vs. Board, etc., of Public Schools, Supreme Court of Missouri, Div. No. 1, 27 S. W. Rep., 610.

Statement Against Architect.—A complaint, under the laws of Massachusetts, alleging that an architect, employed to superintend the erection of a house, had falsely and negligently, and acting in collusion with the builder, represented that a certain amount of labor and materials had gone into the house, whereby the owner was induced to pay the builder an amount of money called for by the contract, is a sufficient allegation of fraud and negligence to show a cause of action against the architect. In giving oral advice or statements to his employer, the architect is, or may be found to be, rendering a purely partisan service, and if he is then he is bound to show reasonable care and

WILLIAMSPORT WIRE ROPE CO.
MANUFACTURERS OF
Iron, Steel and Galvanized
WIRE ROPE
HOISTING AND HAULAGE ROPES
A SPECIALTY.
WILLIAMSPORT, PA.
Correspondence Solicited.

N. W. GODFREY,
Miner and Shipper of Silica,
Washed and Screened.
THOMAS & ECKERSON, AGENTS.
New York Office, 33 an 35 West Thirtieth Street.

Locations for Industries.

The name of the Chicago, Milwaukee & St. Paul Railway has long been identified with practical measures for the general upbuilding of its territory and the promotion of its commerce, hence manufacturers have an assurance that they will find themselves at home on the Company's lines.

The Company has all its territory districted in relation to resources, adaptability and advantages for manufacturing, and seeks to secure manufacturing plants and industries where the command of raw material markets and surroundings will insure their permanent success

Mines of coal, iron, copper, lead and zinc, forests of soft and hard wood, quarries, clays of all kinds, tanbark, flax and other raw materials exist in its territory in addition to the vast agricultural resources.

The Chicago, Milwaukee & St. Paul Railway Company owns 6,168 miles of railway, exclusive of second track connecting track of sidings. The eight states traversed by the Company, Illinois, Wisconsin, Northern Michigan, Iowa, Missouri, Minnesota, South Dakota and North Dakota, possess, in addition to the advantages of raw material and proximity to markets, that which is the prime factor in the industrial success of a territory—a people who form one live and thriving community of business men, in whose midst it is safe and profitable to settle.

A number of new factories and industries have been induced to locate—largely through the instrumentality of this Company—at points along its lines. The central position of the States traversed by the Chicago, Milwaukee & St. Paul Railway, makes it possible to command all the markets of the United States. The trend of manufacturing is westward. Confidential inquiries are treated as such. The information furnished a particular industry is reliable.

Address,

LUIS JACKSON,
Industrial Commissioner, C. M. & St. P. R'y.,
435 Old Colony Building, CHICAGO, ILL.

LEADING MARBLE DEALERS OF THE U. S.

LE GRAND QUARRY CO., Marshalltown, Ia.
IOWA MARBLE. IOWA CAENSTONE.
FOSSILITE MARBLE. OOLITIC LIMESTONE

SCHWEYER & LIESS, King-of-Prussia, P. O. Montgomery Co., Pa.
Producers of
Penna. Blue and Dark Blue MARBLES.
Estimates on all kinds of cut stone work.

WHITE MARBLE.
Adams Marble Co.,
Adams, Mass.

LEADING GRANITE DEALERS OF THE U. S.

MATTHEW GAULT & SON, 700 W. Pratt St., Baltimore, Md.
GRANITE,
Quarrymen and Contractors.

C. L. BATCHELDER, 606 Oakwood Ave., Toledo, O.
Marble, Granite, Monuments, Granite Columns

LEADING STONE CONTRACTORS OF THE U. S.

THE CONNECTICUT FREESTONE QUARRY CO.,
. . . BROWNSTONE,
Cromwell, Middlesex Co., Conn.

PFEIFFER STONE CO,
Cut-Stone Contractors,
ST. JOSEPH, MO.

LEADING CIVIL ENGINEERS OF THE U. S.

W. D. LEWIS,
Perspective Draughtsman. Broken ashlar expert. Office in Y. M. C. A. Building, Rock Island, Ill.

BENJ. F. LA RUE,
Coal Exchange,
Scranton, Pa.
CIVIL AND CONSULTING ENGINEER.
Designs, specifications and estimates for Bridges, Roofs, Building Frames, Stand Pipes, and all kinds of Metal Structures. Special attention given to the designing of Heavy Derricks for Quarry purposes.

judgment. As a consequence of his contract of employment, the law throws the risk of his statements upon him at an earlier point than it would do otherwise. Aside from his contract, he would not be liable for statements, unless fraudulent, or for advice, unless dishonest. Under the contract, negligently erroneous statements and imprudent advice become wrongs.—Corey vs. Eastman, Sup. Jud. Ct., Mass., N. E. Rep., 218.

Lien Law Liberally Construed.—The right of a sub-contractor to a lien is not lost because the notice of lien stated that the contract had been completed, and the contract was all due, when in fact a portion of the work had been omitted, and was afterward performed by the principal contractor and charged to the sub-contractor under the terms of the contract, where such omission was unintentional, and was not known by the claimant until after the filing of the lien, and the statement was made in good faith.—Ringle vs. Wallis Iron Works, Ct. App. N. Y., 44 N. E. Rep., 175.

Substantial Performance of a Building Contract.—A party agreed to build the foundations of three houses for $3,480; that the bottom stone should be laid according to the usual building regulations; and that the cesspools should be cemented throughout. The bottom stone was not of the size called for, nor in accordance with the usual building regulations; and party used dry mason work in the cesspools, instead of cement. The owner had to spend $30 in cementing the bottoms of the cesspools, and then the building department refused to pass them, unless they were rebuilt, which would cost $90. The court held that there was not a substantial compliance with the contract. —Cahill vs. Heuser, Sup. Ct., App. Div. 1st Dept,, 37 N. Y. S. Rep., 736.

Architect Not Limited by Work Done up to Time of Discharge.—Under a contract with an architect to furnish the necessary drawings, specifications, and details for the construction of a building for a certain percentage on the total cost of the construction of the building, the architect after furnishing the drawings, etc., is not limited, in case his employment is terminated before the construction of the building is completed, to a recovery of the percentage on the costs of the building so far as it was completed at the time of his discharge.—Havens vs. Donohue, Sup. Ct. Cal., 43 Pacific Reporter, 962.

THE ACCIDENTS OF LIFE

THE STAR ACCIDENT COMPANY

Write to T. S. QUINCEY, Drawer 156, Chicago, Secretary of the Star Accident Company, for information regarding Accident Insurance. Mention this paper. By so doing you can save membership fee. Has paid over $600,000.00 for accidental injuries.

Be your own Agent.

NO MEDICAL EXAMINATION REQUIRED.

I SEE YOU'RE BACK

from a trip over the

MONON ROUTE

Solid vestibuled trains Daily, heated by steam, illuminated by Pintsch light,

BETWEEN

CHICAGO
INDIAN'POLIS
CINCINNATI
LOUISVILLE
And the SOUTH.

Only line to

West Baden and French Lick Springs,

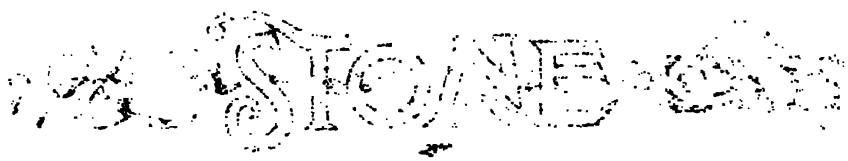
The Carlsbad of America.

W. H. McDoel, V. P. and Gen. Mgr.
Frank J. Reed, Gen. Pass. Agt.

City Ticket Office,
232 CLARK STREET, CHICAGO.

THE QUARRY TEAM. *By S. A. Forbes.*

From a 12"x17" Photogravure by Franz Hanfstaengl



VOL. XV. NO. [illegible]

INSTRUCTION IN [illegible]

[illegible]

THE QUARRY TEAM.

THE NEW YORK PUBLIC LIBRARY
ASTOR, LENOX AND TILDEN FOUNDATIONS

STONE

VOLUME XIV. JANUARY, 1897. NUMBER 2.

*INSTRUCTION IN ARCHITECTURAL DRAWING—II.

THERE is at any rate a great saving of time and trouble in making the lead pencil do all it can. It certainly suffices to teach observation, analysis, delicacy of touch, firmness of hand, the importance of minding the masses and the values, knowledge of form and the sources of artistic expression. When the student has learned how to employ this medium it is soon enough to understand the more difficult manipulations of charcoal and crayon, and at that stage of progress, which our men reach toward the end of their second year, these manipulations are easily learned. But the method under consideration is even better suited to the pen than to the pencil, since it almost precludes blots. In the third year the pen takes the place of the pencil in the rendering of every kind of subject, landscape, buildings, ornament and the human figure. (Plate VII.)

It is moreover eminently a system of interpretation and translation, rather than of the precise imitation of the object copied. In this respect it imparts to drawing from the flat many of the advantages of drawing from the round, the chief merit of which is that it compels the student to convey what he observes in his own language, so to speak, while in drawing from the flat, at least when copying drawings or lithographs, he is tempted to learn the stroke, to imitate the touch, and to prodnce as far as possible a *fac simile* of the original. But to produce a *fac simile* of a drawing is the last achievement of the most accomplished master, and to set beginners to this task, as is so often done, is mere cruelty. It condemns them in advance to failure and disappointment. Whatever the merit of their work, it is bound to be discredited by an inevitable lack of likeness. But in the method under consideration a *fac simile* is impossible; the work is mainly

*Original in *School of Mines Quarterly*. Revised copy furnished STONE by author.

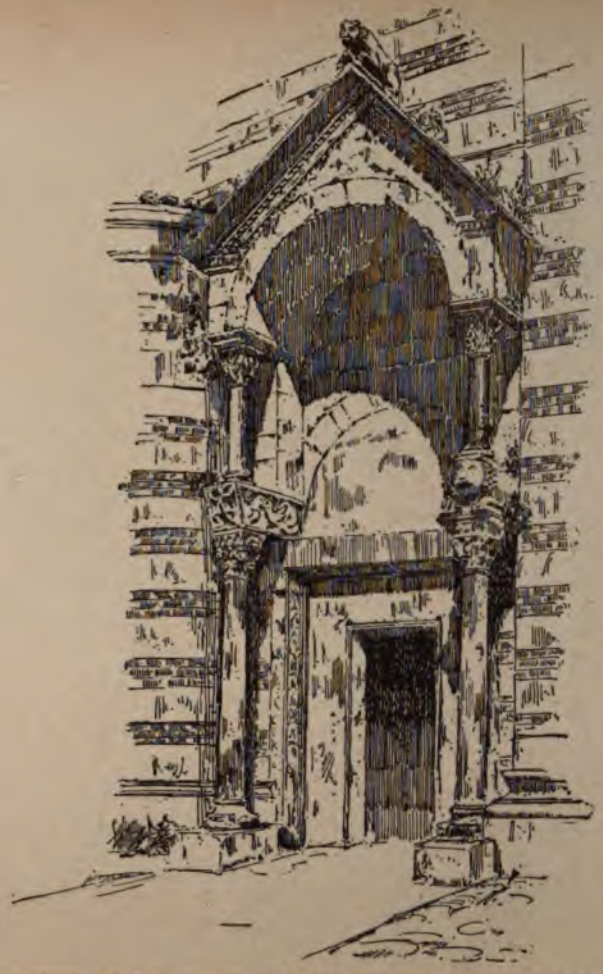


PLATE VII.—PEN-WORK FROM PHOTOGRAPH. SIDE PORCH OF THE CATHEDRAL AT VERONA. L. W

Reduced in scale about one-half.

PLATE VIII.—PEN-WORK FROM LITHOGRAPH BY CICERI. HALF-TIMBERED HOUSE.
Reduced in scale about one-half.

E. J. M.

the student's own; whatever merit it possesses is manifest, and he gets the credit and the encouragement which his pains deserve. Drawing from the flat, whether from lithographs, prints or photographs, is thus made almost as improving as drawing from the round. For this the elaborate lithograph studies of ornament for crayon drawing afford excellent material. To translate them into so different a language, and at the same time to retain the main points of form and expression, is a liberal education in draughtsmanship. (Plates VIII and IX.)

So simple and almost mechanical a method of shading would seem, of course, like the ruling in of skies in an engraving, to possess but little flexibility, and is hardly to be expected to lend itself to the expression of nice distinctions. It is interesting and rather surprising, accordingly, to notice what different results it produces in different hands, and how well it can simulate the touch and manner of different artists, fairly well reproducing, for example, the special quality of Calame's well-known studies, drawings which would seem to owe their special character to their own special medium and procedure. (Plate X.)

Much of this work is naturally done upon a small scale, and the drawings made from the cast, and from large lithographs and photographs, often show considerable reduction in size. But it often happens, especially in the drawings made during the weeks given to historical research, that the copies are larger than the originals, details of carving or sculpture being drawn out full-size from photographs or scale drawings, the enlargement being made either by the eye or by the process of squaring. These afford practice in a bolder manner of work. They are executed with charcoal, the brush or the pen. An admirable substitute for the pen is the wooden toothpick, which gives a soft even line hardly to be distinguished from that of the reed-pen. Any soft stick sharpened to a point, such as the wrong end of a penholder, answers of course just as well. (Plate XI.)

These manipulations have also a great advantage in respect of convenience and economy wherever, as is so often the case both at home and at school, a north-light, a large room and a sufficient supply of plaster casts are difficult to command. In our own present quarters, where there is no place suitable for drawing from the cast, it has enabled us to get along very comfortably with flat copies. But the trials we have made of it in drawing from the round, using such small casts as can be placed on the draughting tables, have shown how sufficient it would be for larger work, and how especially rapid and effective it is in the delineation of architectural details. (Plate XII.)

The considerations that make this procedure so convenient for the draughting-room of an architectural school would make it, perhaps, as has already been said of tracing, an acceptable method of learning to draw in

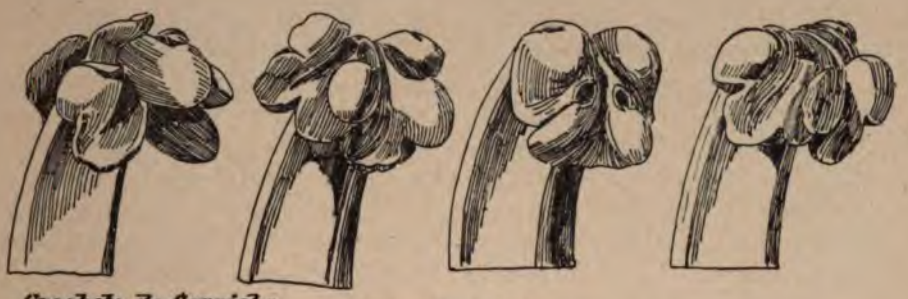
THE NEW YORK PUBLIC LIBRARY

PLATE IX.—PANEL FROM LITHOGRAPH BY PLANTAR. TERRA-COTTA ANTEFIX FROM THE VILLA PONIATOWSKI. H. D. B.

The lithograph reduced about two-thirds, the drawing one-half.

PLATE X.—PEN-WORK FROM A LITHOGRAPH BY CALAME. H. S. H.
About one-half the dimensions of the originals.

Voussure de la porte rouge. *Notre Dame de Paris.*



Crochets de Corniche. *Notre Dame de Paris.*

PLATE XI.—TOOTH-PICK WORK, ENLARGED FROM ENGRAVINGS AND A PHOTOGRAPH. J. C. K.

Reduced about three quarters, nearly to the size of the originals.

schools, public or private. It is easy to learn, economical of time, and ant in its results, so much so indeed, that it seems almost like a trick iable persons but little practiced in draughtsmanship to turn out fairly d work. But it exercises their intelligence, as well as their powers of ob- vation, and while making a good return for a moderate amount of care d skill, it rewards abundantly the most generous outlay. Moreover, the anipulations are so simple as to make it unnecessary that the subject-mat- r should be simple too. It thus throws everything open to the beginner, nd since, as has been pointed out, it tends to bring the use of flat copies once more into repute, it makes it possible to enlist in the task of learning to draw all the interest a student may have in any subject of any kind.

Practiced in this way drawing appears not only as a means of artistic culture, that is as a thing desirable in itself, but as means to an end, as a helpful instrument in the study of almost any subject that either pupil or teacher may care to pick up. For draughtsmanship like language is of use for something besides the expression and communication of ideas. It is of great assistance in forming them, just as writing is a great help in sustained thinking. Writing serves not only to define our ideas but to fix them. It transmutes the passing thought into a permanent remembrance. *Scripta littera manet.* Observations require recording. Reasoning and inference need formulating. Here drawing answers the same purpose as writing. It is an invaluable addition to one's intellectual appliances, and it is because drawing may thus be made useful, not because it is the first step in the prac- tice of the Fine Arts, that it deserves a place by the side of writing in schemes of general education. But the simpler the machinery and the more easily mastered, the more serviceable of course is the machine.

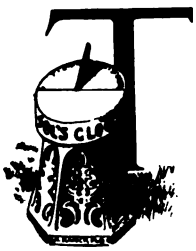
Even where, as in our own case, drawing is taken up not only as an aid to accurate conception and expression, but as the medium by which art is to be studied, and artistic conceptions and artistic skill developed, these simple devices have a definite value, as has already been pointed out. They tend to direct attention to the masses rather than to details, to essentials rather than to particulars, to questions of artistic relation than to difficulties of handling. Any schools accordingly which include the study of the Fine Arts in their course, as a branch of liberal culture, may perhaps find these methods as serviceable as we have found them ourselves.

Prof. William R. Ware.

[TO BE CONTINUED.]

PLATE XII.—PEN-WORK AND PENCIL-WORK FROM THE CAST. F. T. H., M. B. T., E. M. A., C. H. B., H. D. B., H. D. B., H. H., J. T. T., J. A. T., S. T.
Ruduced in scale about three-quarters.

MINNESOTA QUARTZITE.*



THE red quartzite at Redstone, in Nicollet county, Minnesota, which is also seen in Cottonwood, Watonwan, Rock and Pipestone counties, is the hardest stone in the state, or in the United States, probably, that can be stated to have been used for purposes of building. It consists almost wholly of quartz (84.52 per cent.), the red color being due to iron oxide which is disseminated among the grains and throughout their cement. As a layer embraced in this rock, the material known as "red pipestone," or catlinite, is found in Pipestone county and in other places in southwestern Minnesota. This rock is very difficult and costly to dress into dimension blocks, but it is indestructible when once placed in a wall.

The quarry at Redstone, near New Ulm, was opened in 1859. The quarries are contiguous and exhibit the same kind of rock. The layers dip about 15 degrees toward the N. N. W. As compared with the rock of Sioux Falls, S. D., the opportunities here for quarrying are greater, and the stone is much more easily wrought. Its bedding is much thinner and softer, though it is likely that by excavating deeply these beds would be found to be firm and purplish within. Some of the stone is wholly disintegrated, or loosened so as to be a sandrock, losing its color to the depth of 2 to 8 feet, and some beds are loose grained. Some of the lower beds are syenitic.

In Cottonwood county an extensive ridge of this rock, mainly covered by the glacial drift, runs east and west through Storden, Amboy, Delton and Selma townships, and enters Adrian in Watonwan county. Along the branches of Mound creek in Amboy and in Germantown, are frequent and favorable exposures. On the Little Cottonwood river are excellent opportunities for quarrying flagging; some pieces loosened by the action of the water being five or six feet long by three to five feet wide, and three or four inches thick. Many pieces much thinner are also found. Outcrops of the quartzite occur frequently along the summit and on both slopes of this ridge, even where there is no water-course. The rock here has mostly a reddish gray color. Its stratification is in some places nearly horizontal, but more commonly it dips several degrees, often toward the south. The range of quartzite, being the only rock found accessible throughout a wide extent in that part of the state, will be more largely quarried as the coun-

* Extracted from the Geological and Natural History Survey of Minnesota.

try becomes settled more thickly, and as buildings of more substantial character come to be required in the larger towns.

In Rock county are numerous exposures of the same red quartzite, the principal one, known as *The Mound*, being west of the Rock river, near Laverne. This mound is caused by the breaking off, nearly perpendicularly, of the strata of an extensive high plateau running northwest from there, consisting of this rock. The elevation is 175 feet above the river. The perpendicular bluff of rock rises from forty to sixty feet in its highest part, but owing to a dip of about twenty degrees from the horizon toward the west, or partly northwest, and to the breaking of the upper layers, causing a gradual ascent from the brow of the hill backward through several rods, the actual thickness of beds visible may be 150 feet. The rock here appears to be almost entirely a reddish, or pink, heavy-bedded quartzite. If wrought there might be some thinner or softer layers discovered, and such probably exist in the lower parts of the bluff, now hid by the copious talus of refractory and large blocks fallen from the hard layers above. The main bluff curves westwardly at both ends, and by reason of the dip and ravines that enter the valley from the west, its exposed layers gradually disappear under the soil in that direction, but evidently are the cause of the range of elevated land running northwestwardly, since they are seen in numerous other places.

The principal locality in Pipestone county is at the famous quarry of the Indians near Pipestone City, which, however, was worked by them for the layer of metamorphosed red clay which is embraced between the quartzite strata. There has been but little quarrying done at this place, the greater part of it having been executed by the Indians. There is a ledge of rock which runs north and south nearly three miles, consisting of layers of red quartzite with a gentle dip toward the east, forming a perpendicular escarpment toward the west, and rising at its highest point not more than twenty-five feet above the level of the prairie on the west. The rock here in general is exceedingly hard, in heavy layers one to three feet thick, separated by jointage planes into huge blocks of angular shapes, that lie often somewhat displaced. The color is sometimes pinkish, but in the massive portions it is also purplish. When it is brick-red, the strata are apt to be thinner and also more aluminous.

At Sioux Falls, in South Dakota, this rock has one of its characteristic outcrops, not only being the cause of the water-fall but presenting perpendicular walls between which the river flows for some distance before it reaches the falls. The rock here dips six or eight degrees towards the south. The beds are purple within, especially the thick ones, but toward the outside and along the joints they are changed in color to a rose-red, or to a pinkish red. None of the brick-red, heavily iron-stained color can be seen. The effect

produced by weathering not only changes the color but also the hardness, so that the rock goes into a loose sandrock again and crumbles in the hand. This occurs to so large an extent that in suitable places it is gathered and used for mortar. There are also some beds that are now wholly (so far as can be seen) in this friable condition. The sand that results is a pure silica, nearly white, and translucent, though it is apt to show at first a slight pinkish tint, arising from the remains of the cement among the grains.—There is visible here, of the beddlng, a thickness of about fifty feet, and the river goes over the beds from south to north, producing a fine water-power. At the quarries the regular strata are from six to eighteen inches thick. Some of the beds are purple, but that color seems to fade out gradually, passing through the "fawn color" of the Kasota stone of this state, to a light pink sandstone.

For ornamental purposes this rock has not been much employed. It will take a perfect polish, owing to the large content of free quartz, and will contain it longer than any granite. Small ornaments have been made of some of the richly colored strata, and sold under the name of "jasper," and some ornamental bases have been constructed of it. The strata are very regular and firm, but at the same time are broken with a heavy sledge at the quarry. They break at random, and those blocks which happen to present a face suitable are used for range-work in the wall, the remainder being needed for filling and for the back-side.

This stone is destined to be extensively used notwithstanding its refractory nature, because of its accessibility, and at the same time it seems to be one of the most promising formations for flagstone in the state, though it has not been employed for that purpose. Similar quartzites are found in the northern part of the state.

There is another silicious rock, perhaps deserving the name of quartzite, of a very different color and belonging to a very much later geological period, which is seen at several points in the banks of the Minnesota river between New Ulm and Mankato, It has supplied some very good building material, and will also furnish flagstone. The layers are about four inches in thickness as they appear after long weathering and are tough and firm. They are associated with alternating layers of friable sandstone which aid in their extraction. These beds are sometimes so coarse as to warrant their being designated a conglomerate. The whole rock is light colored, or sometimes rusty, and horizontally stratified. As a building material it is very desirable, but the toughness and hardness of the texture, and the thinness of the beds, make it more suitable for flagging than for building. These beds are exposed on the N. E. ¼ Sec. 16, Courtland, Nicollet county, rising 35 or 40 feet above the river, favorably situated for working. Some of the layers reach a thickness of six feet when they are wrought, this effect

arising from the union and cementation of several of the thin layers at some depth within the quarry, a phenomenon which is common to all formations.

Microscopic character.—The quartz is in rounded grains from one tenth m. m. to one m. m. in diameter. They all have the optical characters of crystallization. They are generally not in immediate contact, but are separated by the cemented substance. They contain many impurities which seldom have an evident crystalline form. There are also other large grains which are now nearly or quite opaque from decay. These seem to have been originally some other mineral, perhaps feldspar. Some of these are red in reflected light, and they give the color to the rock, but when reduced in size they seem to be scatteringly disseminated even through the quartz grains, where they do not appear red, but somewhat yellowish, and semi-transparent. The cementing substance is composed partly of this amorphous altered mineral. *H. W. Winchell.*

SOUTH CAROLINA MARBLE.

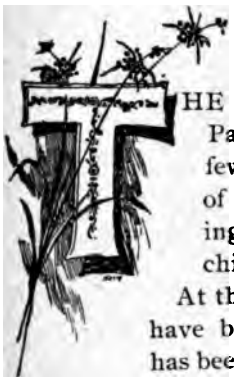
A SPARTANBURG, S. C., correspondent of the Charleston *News-Courier* writes regarding the marble deposit of that section as follows:

"Lately it has been discovered that there is some good monumental marble in this county. It is the clouded variety, and the surface specimens show up as well as the Georgia marble, which is generally used in the South. How extensive the bed is or how easily quarried your correspondent does not know. It is eight to twelve miles from the nearest railway stations. If the bed is extensive it will afford a valuable investment. It has been known for seventy years that there was a fair quality of marble at Limestone Springs. The South Carolina block in the Washington monument at Washington was cut from that quarry. None has been cut since. The bed seems to be extensive and lies near the surface. The owners might develop that and ascertain if it is suitable for tombstones and monuments."

If the South Carolina marble "shows up as well as the Georgia marble" for any purposes it would appear to be expedient and desirable to show it up far more widely than has been done heretofore. The Georgia people have quarried their stone and advertised and exhibited it all over the country. No stone has been cut from the South Carolina bed, it appears, since one was cut "long before the war" for the Washington monument. The bed lies near the surface, but it lies remote from a railroad. Whether it compares favorably with the stone from other states is not known, and no one is making any effort to learn. The quality of the stone might improve very greatly, as usually happens, when the lower part of the bed is reached, but little or nothing is known regarding it below the skin of the deposit. If the stone is fine quality or is suitable for any special purpose, and can be readily quarried, the deposit is a very valuable one. It might pay somebody very handsomely for a little proper and timely enterprise.

CENTRAL MARYLAND GRANITES—III.

GARRETT PARK OUTCROPS.



THE granitic exposures alluded to here as belonging to the Garrett Park district embrace several small outcrops within a radius of a few miles of a new station, so named, on the Metropolitan branch of the Baltimore and Ohio railroad a few miles northeast of Washington, D. C. In the immediate vicinity of the village itself the chief exposures are along Rock Creek, a short distance northward. At these places several small quarries have been opened. The rocks have been considerably sheared, so that a decided schistose structure has been developed. Numerous irregular fragments and blocks of dark gneiss are embedded in places.

At Bethesda some large blocks of granite protrude through the soil in the fields along the Georgetown and Rockville road. They are typical granitites, and contain numerous garnets. Two miles southwest of Garrett Park, Rock Creek cuts its channel directly through a small granite area. On the south side, near the Rockville road, a large quarry has recently been set in operation. The granite is fine-grained, light-colored, owing to the small percentage of ferro-magnesian silicates, and contains numerous basic secretions, lenticular in shape and of various sizes. It may be due to this segregation of the iron minerals that the rest of the mass is so poor in these constituents.

On the east the granite mass is bordered by a soapstone belt, the line of contact being well exposed. A short distance to the south a hill of pyroxenite seems to limit the granitic area in this direction. North of Garrett Park about two miles occurs the area of hornblende granite to which reference has already been made. It is exposed for more than half a mile along the road leading to Rockville. Large bowlder-like blocks lie scattered over the land in abundance, and several large outcrops are noticeable. The rock is rather dark in color, but the different constituents are well defined. There appear to be about equal amounts of both hornblende and biotite distributed through the granite.

ERUPTIVE ORIGIN OF CERTAIN MARYLAND GRANITES.

In the explanation of the origin of large granitic masses two opposed hypotheses have long found favor among geologists. According to the one,

a granite is the last stage in the metamorphic alteration of mechanical sediments. According to the other, a granitic mass is the product of the gradual cooling of an acidic molten magma under pressure. In the first case it is claimed that all the gradations have been traced in the same mass, from undoubted clastics through slaty, schistose, and gneissic phases to the truly granitic types, so that one end of an originally sedimentary deposit may be now unaltered, while the other is a truly crystalline rock. On the other hand, unquestionable eruptive granites are known to pass into gneiss, and even into schistose stages, through the agency of compression and shearing. Regarding the facts deduced in support of the first assumption, and without referring to any specific instances, it seems quite probable that in the majority of cases bearing directly upon this point, sufficient discrimination has not been exercised along the lines separating the semi-crystalline from the holo crystalline areas.

EVIDENCE OF IGNEOUS ORIGIN.

Recently great stress has been laid on the metamorphosing influences of orographic movements in disguising the original character of rocks—making eruptives more and more like sedimentary deposits and clastic beds more and more like massives. Without entering into a discussion of the general subject, it is intended here merely to set forth some of the evidence which points to the eruptive origin of certain of the Maryland granites. That these particular rocks are really eruptive in character has been seriously questioned by some and denied by others.

The evidence that the granites in question are igneous in nature is deduced from several different and independent sources: (1) From field relations, (2) from inclusions, (3) from contact phenomena, and (4) from microscopical examinations.

(1) FIEND RELATIONS OF THE GRANITES.

The eastern half of the Piedmont region consists chiefly of gneisses, broken through in numerous places by undoubted eruptives—as gabbro, diorite, and pyroxenite—until at present these rocks occupy fully one-half of the exposed surface of the district. Now, a careful tracing of the granites shows that they have cut indiscriminately across the igneous rocks mentioned, as well as the gneiss passing uninterruptedly from one petrographically distinct mass to another. In other words, the acidic types of crystallines seem to be younger in age than the gabbros and the most basic rocks, as if they too had broken through all the other eruptives. Near some of the granite masses true granitic and felsitic dikes are clearly defined, which would ordinarily be regarded as apophyses of the main body, were the rock regarded as an eruptive. Furthermore, at Dorsey Run Station, for instance, large exposures show the granite spreading widely apart enormous

layers of twisted and puckered gneiss. At Woodstock huge blocks are completely inclosed in the granite.

As already remarked, the line of contact between the granite and the contiguous rock is seldom determinable exactly on account of profound superficial decay. Yet occasionally artificial excavation into the acid rock reveals clearly such contacts, as at the new quarry opened about two miles northwest of Garrett Park, where the line between the granite mass and the adjoining soapstone belt is very sharply defined.

(2) INCLUSIONS.

Perhaps one of the most conclusive proofs of the eruptive nature of some of the Maryland granites is the occurrence in the mass of large numbers of inclusions—fragments of foreign rocks, both sedimentary and eruptive. At Sykesville, where they occur so abundantly, the irregular angular fragments and blocks of all sizes are identical with rocks of the neighborhood. In most of the cases the interior of the foreign pieces is scarcely altered at all, though the exterior consists of more or less completely metamorphosed shells of varying thickness. The Woodstock and Dorsey Run granites show similar phenomena equally as well, or even better. In both instances blocks of highly puckered gneiss are very prominent, and they all possess narrow marginal borders of dark, fine-grained, completely changed rock, which contrasts sharply with the light-colored surrounding granite. Certain outcrops near Garrett Park furnish good illustrations of the same kind, though here the granite has been squeezed considerably more than in the other cases mentioned. At this place there is one exposure showing numbers of small lenticular masses of a black color which might easily be taken for inclusions but for their regularly rounded outlines. These are doubtless basic secretions which developed in the acid magma.

(3) CONTACT PHENOMENA.

For reasons already explained, the contacts between the granitic masses and the adjoining rocks are rarely seen to advantage. The investigation of the contact zones has therefore been carried on largely with the inclusions. This has been very satisfactory on account of the variety of foreign rocks represented and the abundance of the fragments. In most of the fragments it is only the outside which is changed—to the depth of from two to four cm., or more—the interior still preserving the rock in its original character, so that no doubt arises concerning its composition and structure previous to its embedding in the granite. The contact zones are in all respects identical with the contact belts of other localities where acid eruptives have pushed up against the same kind of rocks.

Chemical analyses of the unaltered inclusions, the metamorphic shells, and the surrounding granites show that the altered shells have an acidity intermediate between the inclusions and the granites.

These proofs of eruptive origin of the Maryland granites are quite similar to those which Barrios* has formulated for the granites of Rostrenen.

(4) MICROSCOPICAL EXAMINATIONS.

Aside from the ordinary microscopical characters indicative of cooling from fusion, certain of the granites under consideration show some additional phenomena pointing to the same conclusion. These are large grains of micropegmatitic intergrowths of quartz and feldspar, rounded through magmatic corrosion apparently, and having the characteristic embayments so commonly associated with cases of this kind. The descriptions of the thin sections have already been given and need not be repeated here.

Charles Rollin Keyes.

*Ann. de la géol. du Nord, t. XII, p. 106, 1885.

[TO BE CONTINUED.]

WILL NOT SECEDE.

To the Editor of STONE:

SIR:—In your issue of December, 1896, appears the following:

"The stone-setting contractors of Chicago, at a meeting, decided to withdraw from the Mason and Builders' Association. Two secret meetings have been held so far, and the secession movement had reached such a stage it was decided to elect officers at the next session. Each member was pledged not to give to the press any news regarding the movement."

In justice to us we want it contradicted, as no such movement has been discussed in our meetings, and there is nothing more foreign to our intentions and interests than secession. GEO. ARCHER, President.

JAMES DAY, Secretary.

THE NIAGARA LIMESTONE FORMATION.

To the Editor of STONE:

SIR:—Over what territory is Niagara limestone found? What are its characteristics and its practical uses? Is there any fine marble in the formation? NIAGARA.

Niagara limestone belongs to the Upper Silurian age. The formation receives its name from the Niagara Falls, at and near where it is well developed, forming the upper part of that notable precipice. The formation is traced from the mouth of the St. Lawrence river to the Gulf of Mexico, and from British America through the Central States to Mexico. It is a dark gray, or drab, limestone, sometimes concretionary, sometimes stratified. It makes good curbing and bridge piers, and road material. It is not, ordinarily, a good building stone. We do not think there is any *fine* marble in it. There comes from it a fossiliferous product that may, and probably does, pass for marble. Our correspondent is referred to LeConte's Geology for a more extended reference.

VALUE OF DIFFERENT KINDS OF STONE PRODUCED IN 1894 AND 1895.

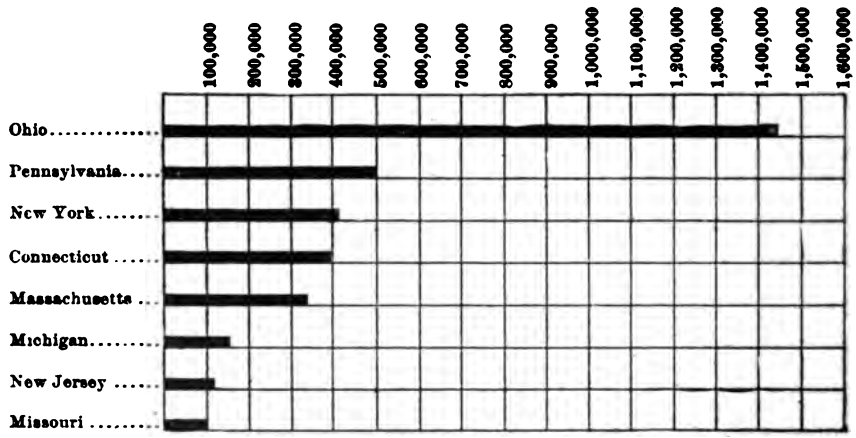
VALUE OF SANDSTONE PRODUCT BY STATES.

THE year 1895 shows a slight improvement in the general condition of the industry.

The following table reveals a total of $4,211,314 as the value of the output in 1895; this means a gain of $265,467 over 1894:

Value of sandstone production in 1895, by States.

State.	Value.	State.	Value.
Alabama	$ 31,930	Montana	$ 31,069
Arizona	20,000	New Jersey	111,823
Arkansas	13,228	New Mexico	2,700
California	11,933	New York	415,644
Colorado	63,237	North Carolina	3,500
Connecticut	397,853	Ohio	1,449,659
Idaho	6,900	Pennsylvania	500,000
Illinois	6,558	South Dakota	26,100
Indiana	60,000	Texas	97,336
Iowa	5,575	Utah	5,000
Kansas	93,394	Washington	14,777
Kentucky	25,000	West Virginia	40,000
Maryland	16,836	Wisconsin	78,000
Massachusetts	339,487	Wyoming	10,000
Michigan	159,075		
Minnesota	74,700	Total	$4,211,314
Missouri	100,000		



The following table shows the output of sandstone, by years, from 1890 to 1895:

Value of sandstone, by States, from 1890 to 1895.

State.	1890.	1891.	1892.	1893.	1894.	1895.
Alabama	$ 43,965	$ 30,000	$ 32,000	$ 5,400	$ 18,100	$ 31,930
Arizona	9,146	1,000	35,000	46,400	.....	20,000
Arkansas	25,074	20,000	18,000	3,292	2,365	13,228
California	175,598	100,000	50,000	26,314	10,087	11,933
Colorado	1,224,098	750,000	550,000	126,077	69,105	63,237
Connecticut	920,061	750,000	650,000	570,346	322,934	397,853
Florida	(*a*)	.....	.....	.....	.....	.....
Georgia	(*a*)	.....	2,000	.....	11,300	.....
Idaho	2,490	.....	3,000	2,005	10,529	6,900
Illinois	17,896	10,000	7,500	16,859	10,732	6,558
Indiana	43,983	90,000	80,000	20,000	22,120	60,000
Iowa	80,251	50,000	25,000	18,347	11,639	5,575
Kansas	149,289	80,000	70,000	24,761	30,265	93,394
Kentucky	117,940	80,000	65,000	18,000	27,868	25,000
Maryland	10,605	10,000	5,000	360	3,450	16,836
Massachusetts	649,097	400,000	400,000	223,348	160,231	339,487
Michigan	246,570	275,000	500,000	75,547	34,066	159,075
Minnesota	131,979	290,000	175,000	80,296	8,415	74,700
Missouri	155,557	100,000	125,000	75,701	131,687	100,000
Montana	31,648	35,000	35,000	42,300	16,500	31,069
Nevada	(*a*)	.....	.....	.....	.....	.....
New Hampshire	3,750	.....	.....	.....	.....	.....
New Jersey	597,309	400,000	350,000	267,514	217,941	111,823
New Mexico	186,804	50,000	20,000	4,922	300	2,700
New York	702,409	500,000	450,000	415,318	450,992	415,644
North Carolina	12,000	15,000	.....	.....	.....	3,500
Ohio	3,046,656	3,200,000	3,300,000	2,201,932	1,777,034	1,449,659
Oregon	8,424	.....	35,000	.....	.....	.....
Pennsylvania	1,609,159	750,000	650,000	622,552	349,787	500,000
Khode Island	(*a*)	.....	.....	.....	.....	.....
South Dakota	93,570	25,000	20,000	36,165	9,000	26,100
Tennessee	2,722	.....	.....	.....	.....	.....
Texas	14,651	6,000	48,000	77,675	62,350	97,336
Utah	48,306	36,000	40,000	136,462	15,428	5,000
Vermont	(*a*)	.....	.....	.....	.....	.....
Virginia	11,500	40,000	.....	3,830	2,258	.....
Washington	75,936	75,000	75,000	15,000	6,611	14,777
West Virginia	140,687	90,000	85,000	46,135	63,865	40,000
Wisconsin	183,958	417,000	400,000	92,193	94,888	78,000
Wyoming	16,760	25,000	15,000	100	4,000	10,000
Total	10,816,057	8,700,000	8,315,500	5,295,161	3,955,847	4,211,314

a Sandstone valued at $26,109 was produced by Rhode Island, Nevada, Vermont, Florida and Georgia together, and this sum is included in the total.

THE SANDSTONE INDUSTRY IN THE VARIOUS STATES.

Alabama.—Reports indicate a much more satisfactory condition than that which prevailed in 1894, although, of course, the industry is still struggling under adverse financial conditions. Prospects for 1896 are regarded as good.

Arizona.—Quarries near Flagstaff were in operation during the year, producing an output valued at $20,000. This speaks well for the development of what may be before long an industry of some magnitude.

Arkansas.—Operations of sandstone quarrying have never reached a considerable magnitude in Arkansas, but proportionately much more was done in 1895 than in 1894.

California.—Reports of operations in sandstone quarrying in California are rather discouraging, and an output valued at $11,933 is much smaller than was produced in this State a few years since. Building operations were very much curtailed in the past year.

Colorado.—When the large sandstone outputs of 1890 and 1891 are considered, it is evident that at present the possibilities in this industry are far from being realized. It is encouraging to note, however, that better conditions for 1896 are unhesitatingly predicted by a number of the producers.

Connecticut.—The important and long-known sandstone quarries of Portland and Cromwell, Conn., yield most of the state's output of sandstone. Quite a marked improvement is to be noted for the year 1895, but the industry, as in most states, is far behind what it was in 1890 and 1891. Some of the producers appear to be much encouraged at the outlook for 1896.

Indiana.—Quite a decided improvement in sandstone production is evident for the year 1895. Most of the operators report an encouraging outlook for 1896.

Kansas.—A decided increase in output characterizes this state in 1895. The output of 1894 was valued at $30,265; the product of 1895 reaches the valuation of $93,394. This is due to the increased output of a small number of producers. Prospects for 1896 are good.

Massachusetts.—The year in Massachusetts has been the most productive of sandstone since 1892. The gains are due to the considerably increased output of a few important producers. Small operators complain of the hard times, and quite a number have stopped work until business generally shall improve.

Michigan.—The total value of the sandstone output in 1895 ($159,075) means a heavy gain over 1894. Of this total, $35,107 is the value of grindstones and whetstones. In the production of these articles Michigan is annually increasing in importance, and the cessation of hard times will probably be marked by quite decided gains in this direction. Next to Ohio, Michigan is the most important state in grindstone and whetstone production.

Minnesota.—The sandstone output in Minnesota was quite restricted in 1894, but by the operations of a few new firms the output of 1895 very largely exceeds that of the preceding year. The outlook for 1896 is encouraging.

Missouri.—The output of 1894 was valued at $131,687. Owing to the fact that a number of quarrymen ceased operations during 1895, the total output was reduced to a value of $100,000 in 1895. Complaints of business depression have been made by nearly all of the producers.

Montana.—The output of Montana increased from $16,500 in 1894 to $31,069 in 1895. The latter figure includes the value of stone used for lining comforters and furnaces operating in the state. This stone was not on the market, but was quarried by the consumers.

New Jersey.—The sandstone interests of New Jersey have been in the past, notably in the years 1890, 1891, and 1892, of very considerable magnitude, but the business depression of the past few years has been very seriously felt. There seems to be no other reason for the falling off in production, as the stone has an established reputation as a valuable building material. Many of the quarries have ceased operations in the past two or three years. The output of 1895 was valued at $111,823.

New York.—The sandstones of New York have been so long and so favorably known that the financial depression of the past few years has done as little harm in this state as in any other in the country. The output of 1894 was valued at $450,992, and while the value for 1895 ($415,644) is somewhat less, the difference is not great. The general opinion seems to be that 1896 will show a decided gain.

Ohio.—This state is far in the lead in producing sandstone. The output of 1890 was valued at $3,046,656, in 1892 at $3,300,000; since the last named year the output has been declining, owing, apparently, only to the trying financial conditions which have marked this period. The output of 1895 is valued at $1,449,659. Most of the grindstone output of this country comes from Ohio. The value of the grindstones and whetstones produced is included in the above figure.

Pennsylvania.—The output of Pennsylvania was valued at $500,000 in 1895. This means quite a gain over 1894. The product is the result of the operations of a large number of comparatively small producers. Business was much better after August.

South Dakota.—Owing to the commencement of quarrying operations by a few new firms, the output of this state increased from $9,000 in 1894 to $26,000 in 1895. The sandstone of South Dakota is well worth the attention it has received, and there seems at present to be no doubt but that 1896 will show a considerably increased output, if financial conditions will permit.

Texas.—Owing to increased operations of a few important concerns, the output of sandstone in Texas increased from a valuation of $62,350 in 1894 to $97,336 in 1895. This is the highest figure yet reached for sandstone in the state.

West Virginia.—Production in West Virginia was not up to the average during 1895. There is plenty of good bridge and building stone in the state, but poor demand and low prices have restricted quarrying operations during the past two years.

Wisconsin.—Production fell from $94,888 in 1894 to $78,000 in 1895. The prospects for 1896 are much better. *William C. Day.*

[TO BE CONTINUED.]

GEOLOGY FOR QUARRYMEN*

ROCK CLEAVAGE AND FISSILITY.

THE property of cleavage in rocks is here defined as a capacity present in some rocks to break in certain directions more easily than in others. By virtue of this property rock masses may be split into slabs or into leaves. The term cleavage is taken from a property in minerals, and is here confined to a strictly parallel usage. This definition does not agree with that ordinarily given in the text books, but it is believed that the restriction is a gain for accurate discussion. The structure corresponds to Sorby's "ultimate structure" cleavage.

Fissility is here defined as a structure in some rocks by virtue of which they are already separated into parallel laminæ in a state of nature. The term fissility thus complements cleavage, and the two are included under cleavage as ordinarily defined. Where a rock is finely fissile it may be called foliated. Fissility corresponds in part to Sorby's "close joints" cleavage.

The terms slate and schist, slaty and schistose, slatiness and schistosity, are retained with their usual significations. A slate may be defined as a rock having the property of cleavage or fissility, or both combined, the rock parting into layers with relatively smooth surfaces. In slates the mineral particles are usually of small size. A schist is a rock having the property of cleavage or fissility, or both combined, the rock parting into layers with rough or wavy surfaces. In schists the mineral particles are larger than in slate. As is well known, there are all gradations between slates and schists. In origin and essential characters the two have many properties in common. Schistosity, however, indicates more severe metamorphism than slatiness. It follows, from the above definitions, that a slate or a schist may have the property of cleavage or of fissility or of both combined. When both are present they may be parallel or intersecting. Both may occur in the same slate or schist in more than one direction.

Sorby explains rock cleavage as mainly caused by the rotation of mineral particles, and especially mica, so that their longer diameters and the cleavage of the mica particles are normal to the greatest pressure. The rock readily parts along the greater dimensions and cleavage of the mineral particles. The minute mica plates were supposed to be fragmental particles deposited

*Reprinted from Sixteenth Annual Report U. S. Geological Survey.

age, or both, in a common direction, and that this arrangement is caused, first and most important, by parallel development of new minerals; second, by the flattening and parallel rotation of old and new mineral particles; and third, and of least importance, by the rotation into approximately parallel positions of random original particles. The propriety of the definition of rock-cleavage as first given is therefore evident. It is always due to a capacity to part, and very frequently the parting does occur by the actual cleavage of the mineral particles.

DEVELOPMENT OF CLEAVAGE IN HOMOGENEOUS ROCKS.

Becker has recently rediscussed the origin of cleavage, and concludes that it always develops in the shearing planes rather than in the normal

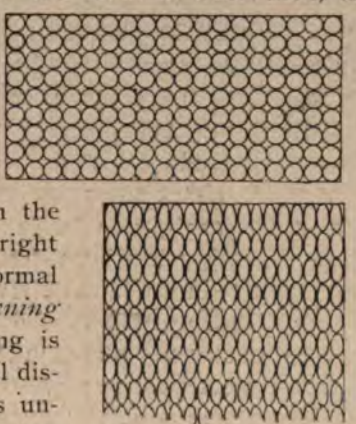
FIG. 101.—THIN SECTION OF A MASHED QUARTZ-PORPHYRY.

planes. Even in the case of the experimental development of a cleavage structure in wax, which is strictly normal to the pressure, the structure is explained as developing in the shearing rather than in the normal planes.

As will be seen below, it is my own conviction that a structure develops in the normal planes under certain conditions, and that under other conditions structures develop in the shearing planes, as advocated by Becker. The first is believed to be a deep-seated phenomenon of the zone of flowage;

the second is believed to be a more superficial phenomenon in the zone of fracture. In other words, as already stated, it is thought that under the term cleavage two entirely distinct structures of different origins have been confused. Theories which explain or partly explain one of these structures have been extended to cover both of them, because it was not understood that they are different.

Rocks when deformed under great weight flow as a plastic solid, and under these circumstances, as shown by the geologists above cited, the property of cleavage is developed. At all times the particles of the rock are welded together (Fig. 101). Fissility will not form, for by the supposition the rocks are so deeply buried that no crevices can exist. In the formation of flowage cleavage or cleavage proper, as the term is here used, the thrust may be from one or more than one direction. It may vary in force both horizontally and vertically. In any case there is flow of the rock mass in the direction of least resistance. If the force be applied so that there is uniform shortening in one direction, as in the case of a rigid piston, the elongation is at right angles to the direction of thrust, or in the normal planes. This may be called *pure shortening* (Figs. 124 and 125). By pure shortening is meant the particular kind of non-rotational distortion illustrated. The volume remains unchanged, the shortening in one direction being compensated by equivalent elongation at right angles to this. In this kind of deformation, while there is no differential movement or shearing in the normal planes, shearing does occur along all of the intersecting diagonal planes. It makes no difference whether the movement is wholly from one end of the mass or in part from both ends. But when the lateral force varies greatly at varying depths the deformation may vary from pure horizontal shortening to a nearly horizontal differential movement combined with shortening (See Figs. 127 and 128 in December STONE.) Such inclined differential movement is dependent both upon the varying force of thrust in passing from higher to lower horizons and upon increased friction with greater depth, due to gravity, which acts as an opposing force. In the case last illustrated the deformation is a simple shear. The deformation here called pure shortening is defined by Becker as a shear, and a shear, as just defined, is called by him scission.



Figs. 124 and 125. — Diagrams showing theoretical change in arrangement and form of particles when uniformly shortened by hydrostatic plastic flow.

Ordinarily, at any place in the rock mass the three principal stresses are

unequal. If the differential stress surpasses the elastic limit of the rock it produces shortening in the direction of greatest stress, elongation in the direction of least stress, and shortening or elongation in the direction of mean stress, depending upon whether the latter is nearer the maximum stress or the minimum stress. The phenomena subsequently described appear to show that there is more frequently elongation than shortening along the direction of mean stress. It follows that as a result of flowage there is usually one direction of shortening and two of unequal elongation. The plane of the minimum and mean stresses is believed to be the plane of cleavage.

A coherent slate, which has the unmodified property of cleavage as here defined, shows but a single marked structure. This structure in the dense slates is often nearly normal to the direction of the greatest shortening of the strata. In the many instances in which cleavage is everywhere nearly parallel to intrusive igneous masses, there seems to be no escape from this conclusion. In such cases a zone of slate or schist surrounds a granite or other mass, the secondary structure varying in direction through 360°, thus making a circle about the intrusive core. The cleavage is therefore at each point nearly at right angles to the greatest pressure. Such zonal cleavage about batholites has been described in this country at various localities. The cleavage in the mica-shist adjacent to the granite core of the Black Hills is everywhere parallel to the igneous mass. Lawson has described like phenomena at many places in the mica-schists of Ontario. The secondary structure is everywhere parallel to the adjacent igneous masses. Emerson finds that the same relations obtain between the secondary structure and the intrusive granites in Massachusetts. Similar phenomena have been described in other countries at localities too numerous to mention. In all of these cases there can be no doubt that the magmas were under hydrostatic conditions and transmitted their pressures at every point normal to the rocks with which they were in contact. There would therefore seem to be no escape from the conclusion that in such cases the secondary structure developed in planes normal to the pressure.

In homogeneous slates having cleavage it is not usually possible to follow the particles through their movements to their final positions. However, in rocks which are not so nearly homogeneous there are numerous minor plications. Where these plications are arranged in a symmetrical fashion, that is, do not have one set of limbs longer than the others, they give strong evidence that the thrusts were in opposite directions and normal to the secondary structure. If the rock were homogeneous the crumplings would disappear and the movement of the particles would more nearly follow the law of plastic flow. Such deformation of the particles may be without dif-erential movement normal to the pressure, and is illustrated by Figs. 124

and 125 in an ideal case. It is not necessary that the particles be of the same size or of the same strength. As is known by macroscopical study of the schist-conglomerates and by microscopical study of ordinary slates and schists, if the movement continues far enough the old mineral particles are flattened, or flattened and rotated into parallel positions. New minerals develop with similar orientation. Therefore, as a consequence of the flowage of the stratum, the induced arrangement of the particles necessarily produces a capacity to cleave in the plane of the two longer axes of the mineral particles, as in this direction the rock may part between them.

In the case of forces resulting in a rotary movement, the structure may be explained as developing in the normal planes as in the case of pure shortening. The direction of shortening of any small area varies in its relation to the component particles at each successive moment. This variation may be due to the work of stress-couples producing simple shearing, to a change in the direction of pressure, or to a rotation of the area concerned, or two or all combined. The final result is to deform a given homogeneous area as though it were shortened in but a single direction, and after this was rotated. The cleavage is at right angles to the direction of greatest shortening of the area in its final position, this structure being due to the capacity to part parallel to the greater dimensions of the mineral particles. This resultant position is not normal to the final direction of greatest pressure, but at any given moment the deformation occurring is itself normal to the pressure. Newly developing minerals also tend to form at any moment with their shortest axes in the direction of pressure, and are rotated by the simple shearing exactly the same as the original minerals. Therefore the shortest axes of both new and old minerals are in the same direction. Thus the cleavage develops strictly in the normal planes, but its position by the rotation of simple shearing is inclined to the final direction of pressure.

I therefore conclude from analysis, from experiments upon viscous and plastic bodies, from observations in the field, and from studies with the microscope, that I am justified in the statement that the secondary structure of a rock which is deformed by plastic flow develops in the plane normal to the greatest pressure, and that this structure is true cleavage.

We thus see that in both the case of pure shortening and the case of shortening combined with rotation the secondary structure is parallel to the greatest dimensions of the mineral particles. This parallelism may be macroscopically observed at very numerous localities in which schist-conglomerates occur. Some of the more important of these are the Hastings district of Ontario, Green Mountains of Vermont, Felch Mountain district of Michigan, many localities in the basal conglomerates of both the Upper Huronian and Lower Huronian in the Marquette district of Michigan, the Black Hills of Dakota, and the Front Range of Colorado.

In different localities the degree of flattening of the pebbles varies from a small amount to that in which the pebbles are transformed into leaf-like areas. Everywhere and in all grades of change the secondary structure accords with the longer diameters of the flattened pebbles. The same phenomena have been observed by me in microscopical studies upon fragmental particles in hundreds of sections of the semi-crystalline formations from many parts of America.

It is a very common phenomenon in slates and schists, both macroscopically and microscopically, for the direction of the secondary structure to wrap around the harder particles. As a hard grain or pebble is approached the cleavage structure in the matrix opens out on each side of the grain, envelops it, and closes in again beyond it. The structure nowhere intersects, although upon opposite sides of a particle, near the end, the structures converge and come together as the end of the grain is reached. They would intersect if continued in their original direction. While the cleavage of the matrix, where there are many harder particles, constantly varies in direction, it nowhere intersects. Its average direction is the same as that of other parts of the rock in which resistant particles are absent. Because the structure of the cleavage, where hard particles are present, simulates a mesh structure, loose observation might lead to the conclusion that there are present two intersecting structures. The prime characteristic of a true mesh structure is that two diagonal structures shall intersect. As shown subsequently, intersecting diagonal fissility may develop in the shearing planes.

The deviation of cleavage about hard particles is explained by the fact that the more resistant grains act as a transmitter of forces. At any given point at the exterior of a hard particle the direction of greatest pressure is normal to the grain, and hence the peripheral arrangement of the cleavage about the grain.

The crucial point in deciding whether there is a structure which develops in the normal plane is the simple matter of fact as to whether or not the flattening of the original particles corresponds with this structure. It is believed by me, as will be seen, that the theory that cleavage is developing at any given moment normal to the pressure fully explains all the diverse facts of true cleavage in both homogeneous and heterogeneous rocks.

The amount of shortening of the area of a rock mass necessary to produce the property of cleavage may not be great in a slate, as shown by the amount of distortion of the bedding. In proportion as the shortening becomes greater the rock is apt to change from a slate to a schist. If the process of shortening continues until a schist is produced, it is often difficult or impossible to estimate the amount of horizontal shortening of the strata, but it is certain from observation that it is usually considerable, perhaps to one-half or one-third of the original. This is shown by the plications of layers of a

its longer diameters in the plane of bedding, thus giving at the outset a laminated structure. This structure may be emphasized by the pressure of gravity. It therefore follows that the unaltered sedimentary rock ruptures more readily along its bedding plane than elsewhere. That the capacity to part parallel to bedding is less marked than parallel to the cleavage of slates and schists is due to the fact that the ratio of the minor to the mean and major diameters of the mineral particles is not so large and the regularity of the parallel arrangement not so nearly perfect in the original sediment as in a slaty or schistose rock. If a maximum deforming force be normal to the bedding, as it may be in some cases, the original imperfectly parallel arrangement of the mineral particles, with their longer axes in the direction of bedding, would be so much done toward producing a cleavage, and the result would be to give a more highly developed secondary structure parallel to the bedding with a given amount of movement than would result from the same deformation in a different direction.

In some instances observations show that the conjoint action of tangential thrust and friction throughout considerable masses of rocks was apparently such as to give approximately uniform shortening of the strata in one direction. The material is confined on all sides, and its deformation is that of a plastic solid. The direction of least resistance is toward the surface of the earth. The direction of mean resistance is at right angles to the minor thrust and parallel to the surface. Consequent upon the flow, the mineral particles, new and old, at any particular point arrange themselves with their longer axes in the plane of these directions. This plane is vertical, or nearly so, and almost at right angles to the major thrust. Therefore, in approximately homogeneous rocks cleavage is frequently vertical or highly inclined, and hence intersects the bedding. This may be called cross cleavage.

But supposing the lateral thrust to vary greatly in depth, and considering that friction increases with depth, the movement may vary, as explained above, from upward plastic flow to differential movement in a horizontal direction. In this change we have passed from a pure shortening to a simple shearing. The cleavage would be nearly parallel to the bedding, and it may be called parallel cleavage. In the case of parallel shear the cleavage would accord in its principle of development with that of parallel cleavage in heterogeneous rocks.

These extreme cases rarely occur. Almost invariably there is a combination of pure shortening with shearing motion. The combination is ordinarily such as to give steeply inclined cleavage cutting the bedding, and therefore a cross cleavage. There are, however, undoubted gradations between cross cleavage and parallel cleavage. In all cases in nature the final resultant or direction of movement depends upon a union of all the forces concerned. *Charles Richard Van Hise.*

And for his squandered fortunes curse his name.
Slave to a gluttony that knows no law
Not e'en himself, so vast his hunger's rage,
Though swallowed piecemeal would his want assuage!
His funeral's cost, his tomb ancestral's price
Dissolve in feasts and glut his darling vice."

The onyx was certainly not considered a fortunate stone in olden times, in fact, under certain conditions it was said to expose its owner to the attacks of demons. It caused occasionally ugly dreams at night, and that bugbear of the good old ancients, lawsuits by day. If, however, a sardonyx was worn with it, or the sardonyx substituted, this evil effect was counteracted. This last-named stone was said to be the correct jewel for young men to wear when going a-courting, as it influenced members of the fair sex to look upon them favorably.

A very pretty Greek story is told about the origin of the onyx, which as a word of Greek origin we may count as the most correct rendering of the name. The mischievous Cupid taking a morning walk was said to have come upon the sleeping Venus in some shady bower, and, unbeknown to the beautiful goddess, pared her finger nails with the sharp point of one of his arrows. The portions cut fell into the Indus and sank out of sight, but being of such a heavenly nature they did not become lost, but were turned into the onyx stone, where they remain a lasting memorial of the blind god's tricks. Chaplets and rosaries were, and are still, often worn by the fakirs in India, made as a rule of onyx. Though this stone was supposed to cause strife between the dearest friends and occasionally to engender melancholy, yet it cured epilepsy, and for this reason its many other evil omens were oftentimes overlooked. It is constantly mentioned in Greek and Hebrew writings before the Christian era, although the onyxes of the old writers are generally supposed to have been a banded variety of carbonate of lime. It is the eleventh stone mentioned in Aaron'e breastplate, and many writers consider that the fatal ring of Polycrates was composed of onyx stone, or contained one set. The antique Indian stones often have a hole drilled through them, for they were and are still worn as beads, even when not used as rosaries, in the East.

In the Besborough collection one of the most beautiful onyx stones represents a fly in full relief, which stands out in all its iridescent hues, even the gaudy shimmer of its wings being shown by the marvelous workmanship, the play of colors being brought out in a most wonderful manner; it is one of the most delicate examples which have been handed down to us. The Oriental onyx is composed of silica with traces of coloring matter. Its specific gravity is 2.6 and its degree of hardness 7. It is known as an amorphous stone, meaning that it has no determined form or crystallization. There is a very celebrated tinted variety obtained from India, others come

from Egypt, Yemen in Arabia, and Armenia; they are also found in the Isle of Skye, in Perthshire, and parts of Ireland; an inferior variety is obtained from Hungary, Bavaria, Bohemia, and very largely from certain parts of Germany, though the German onyxes are very much cheaper than those which come from the East. Of course, the sardonyx, which takes its name from the union of the two gems and consists of layers of chalcedony and carnelian, is of the two the more beautiful stone, but one variety known as nicolo or onicolo, with a deep brown ground over which is a very thin layer of bluish white, through which the deeper ground shows up in a modified shade, is found in Bavaria and the Tyrol, and in this beautiful effects have been obtained. Many of the German onyxes are stained to give them a better color before they are put upon the market.

Sometimes this stone is found in very large masses, large enough to form small pillars such as we see in the Basilica of St. Peter's in Rome. In the temple of the Three Magi in Cologne there is an onyx larger than the palm of the hand. In the Vatican there are several most exquisite cameos to be seen in this stone, notably one which is said to have belonged to the Emperor Augustus. In the Imperial Library in Paris is a cameo in onyx of Marcus Aurelius and Faustina, another which represents Agrippina and her two children, and one representing the very favorite subject, Venus rising from the sea, surrounded with Cupids gamboling in the waves, the figure most exquisitely cut and shown up in relief by means of the white bands; a Jupiter armed with lightning is another beautiful cameo. The historically celebrated "Cup of the Ptolemies," a two-handled vase cut in onyx, has also come down to us. This vase holds one pint, and measures nearly five inches in height by a little over fifteen inches in circumference. In 1804 this most precious relic was stolen from the Musée in Paris, and the gold mounts which belonged to it were melted down by the robbers; the cup, however, was in the end recovered. The sides of the vase are covered with masks, small vases, and Bacchic emblems, such as were favorites with the early engravers. In the ninth century this cup was presented by Charles the Bald to the Abbey of St. Denis, and after that date it was put aside to hold the consecrated wine offered to the Queens of France at their coronation. This exquisite relic was pawned by the impoverished monarch Henri II. of France to the Jews of Metz for the sum of one million livres tournois, equal to about £50,000 in our money.

In the treasure of the Canton of Schaffhausen is what is known as the Schaffhausen onyx, another very celebrated stone, the cutting of which dates, as it is supposed, to the years 68–82 A. D. It was supposed to have been brought from Constantinople by Ortlieb von Frohberg, the bosom friend of Conrad III. and Frederick I., who fought valiantly in the second Crusade. It represents a female figure wearing a crown of honor, holding

in one hand cornucopia, the horn of plenty, and in the other the staff of Mercury. The figure has been identified as representing Pax. The later history of this beautiful stone is somewhat obscure; its history might prove an object of interesting research. *Agnes Hume.*

GEORGIA MARBLE.

GEORGIA marble is gaining wider recognition throughout the United States. The Corcoran Gallery in Washington, St. Luke's Hospital, New York, the Capitol at Providence, R. I., and buildings in Chicago and other Northern and Western cities have been constructed wholly or in part out of Georgia marble selected in competition with marble from Vermont and other states.

The deposits of marble in Georgia are practically inexhaustible. The superintendent of the Georgia Marble Company made this broad statement to the writer, that if all the houses in the United States, big and little, were destroyed, every one of them could be rebuilt out of Georgia marble. Col. E. P. Howell, who was present, added: "Yes, and if they had the machinery to quarry it and place it in position, they could erect a monolith out of Georgia marble that would be higher than the Washington monument in Washington City."

I asked President Clement, of the Georgia Marble Company, who lives in Chicago, as to the extent of the deposits and the correctness of the statements given above. He was sure that a monolith 300 feet high could be quarried if they had the machinery to get it out, because they had penetrated 300 feet and found marble, and, he added, Col. Howell may be correct; but as to the statement of the superintendent, he did not tell the whole story. There is no exaggeration at all in the declaration that, if all the houses, not only in the United States, but on the American continent, were destroyed, so inexhaustible is the supply, they could every one, large and small, be rebuilt out of Georgia marble.

The Georgia Marble Company has expended in the neighborhood of one million dollars, but the work of development has just commenced. Georgia is blessed with natural bounties that are dormant in her mountains and hills, in her valleys and plains, in her forests and rivers. In the near future, these bounties will be fully utilized. With manifold natural advantages, with varied products and diversified industries, with climate and health, with never-failing water power, with navigable rivers and capacious harbors, and with great railway systems webbing the state, Georgia should easily hold front place among her Southern sisters, at the head of the column in development and industrial progress.—*Atlanta Journal.*

reports well of you you've no call to go on tramp again. Now come along into the office and let me enter you on the book."

I waited till that was done, and then I led the way into the workings.

Our Rochehaut quarry is one of the oldest in the province of Luxembourg. For more than two centuries the shafts have pierced their way further and further back into the slate bed in the mountain side. The facing at which we were then working lay about 150 meters from the daylight, along a horizontal shaft which sloped slightly inwards. This shaft and one or two old ones are all entered from a kind of cavern or grotto on a level with the river. This grotto is always cool and dim, even on the hottest summer day, and it has, moreover, a kind of solemnity for us quarrymen, for over the dark mouth of the shaft, on a rough shelf, there gleams out of the twilight a figure of Saint Barbe, our patron saint, and on either side the saint a vase of flowers. The figure is older than the oldest quarryman; no one knows how long it has stood there, but Christophe Delhogne, the hunchback, is responsible for the flowers. He has all sorts of ideas, and one idea was these vases. We none of us made any objection; rather the contrary.

I stopped at the shaft mouth to light candles for myself and the new hand. As I gave him his I saw his eyes fixed on the figure above us, and a sneering smile on his lips.

"Sacre nom!" he cried in mock astonishment. "What on earth is that?"

"It is Sainte Barbe, our patroness," I replied, taking no notice of his sneer.

"Tiens!" he exclaimed, "you don't mean to say you haven't emerged from the epoch of patron saints yet."

"We haven't," I replied, "and I hope it will be long before we do."

He gave a hearty laugh.

"Sainte Barbe," he repeated; "and what's her specialty?"

I turned round and looked him full in the face.

"Look you here," I said, "you've found a job where you'd little cause to expect one, but let me tell you we've no mind to harbor freethinkers. I've some experience of what a scoffer—as you seem to be—can say of such ways as we cling to here, and my conclusion is that a man keeps straighter by believing rather too much than too little."

He laughed again.

"I understand," he said: "I draw my 20 francs a week at the pleasure of Sainte Barbe, so I'd better be respectful to her."

He said no more, either then or later, on the subject, but that was quite enough to show that he was altogether of another way of thinking from most of us, for at Rochehaut we led simple, frugal, old-fashioned lives, and the new revolutionary notions that we heard talk of now and again in politics and religion sounded to us flimsy and worthless in comparison to the creed we had learned from M. le Cure in the parish church at the evening catechising.

However, let the Frenchman hold what opinions he would, he was brisk enough at his work, and I had a good report to give to Pascal when he asked me that evening how the new loader shaped.

As I started home afterward Christophe Delhogne, the hunchback, joined me at the foot of the steep path that leads through the woods to the village above. He, too, worked at the facing.

"Gilbert," he said, lookiug at me sharply from under his shaggy brows, "Gilbert, what about that Frenchman?"

"Well," I repeated, "what about him?"

"Nothing more than this," he replied—"that if I had been the patron, I wouldn't have taken him on."

Now, if Christophe had heard the Frenchman's sneers, I could have understood, but he had not heard.

"Perhaps you wouldn't," I said. "We all know you're far from being as soft-hearted as the patron; still the man's worth his pay. I've watched him well to-day."

" So have I," he replied, "and I know you'll think it just one of my fads; but, Gilbert, I don't like the looks of him—no I don't."

I was going to ask him why not, just to see how he had added the stranger up—for Christophe was very cute—when we heard quick steps behind us and the man we were talking of joined us.

" Ah!" he said, looking at Christophe, "I was after you. You can lodge me, I hear."

"Can we?" said the hunchback brusquely. "Who said so?"

"The patron—Pascal said so. He said your mother has——"

"The patron talks a lot too fast, "interrupted Christophe. "We don't take lodgers and we don't want to."

He dropped behind us as he spoke. Raux looked after him and laughed.

"Perhaps the old woman will be easier to deal with."

"Very likely," I said: "still if I were you, I'd try elsewhere."

"I shall do no such thing," he retorted: "that fellow's got a twist in his temper as well as in his spine. I saw him look at me over his work to-day as if he had taken spite against me. The patron says the old woman is a tidy sort of body, and if I like the looks of her, I'll have the room just to serve that grumpy chap out."

I said no more; it wasn't my business, only I liked the stranger none the better.

Between the edge of the wood and the village is a belt of grass-land, and as we climbed on up we saw Celine Pascal sitting there minding the cattle as they ate their evening meal on the hillside. She was leaning her head on her hand, her large sad eyes were fixed on the distant hills, behind which the sun was beginning to sink in a glow of crimson and gold. The path led us close past her, but she did not seem to see us.

"Bon soir, Celine," I said.

"Bon soir, Gilbert," she answered, without turning her head.

The stranger looked at her partly with curiosity, partly with admiration.

"Bon soir, mademoiselle," he began; "it is hot work climbing your hill when one is not used to it."

"I dare say it is," she replied gravely, scarcely looking at him.

"What a splendid evening," he began again; but this time she took no notice at all; perhaps she thought he was speaking to me. We walked on.

"I should think it would be uphill work to make love to that one," he said. "She doesn't look as if she'd give a man much encouragement."

"She wouldn't either," I said.

"And why not?" he asked: "is she a votary of Sainte Barbe?"

"That is neither your business nor mine," I answered sharply.

"I beg your pardon," was his reply; "a handsome girl like that is any man's business—as long as she is still to be had, and I don't think Mlle. Celine has a sweetheart, to judge by her looks."

"You're a deal too sharp," I said.

"Well, has she?" he persisted.

"I have no more to say," I repeated once more, "except that it's no business of yours and mine."

I might have told him more had I chosen; but I didn't choose. His way of asking vexed me.

"And now about Mother Delhogne," he said as we reached the village; "the patron said the first house on the right hand side."

He stopped, looked round him, and then knocked at the door. I looked too. Christophe was not in sight. I knew he had stopped to talk with Celine.

That evening, before my wife and I had finished supper, the door opened suddenly and the hunchback came in.

"Gilbert," he cried angrily, "you heard what I said to that fellow coming up the hill?"

"Yes," I replied, "I heard and so did he, but I guess he didn't heed."

"He didn't. When I got home there he sat with his pipe in his mouth, and my mother stood at the door brimming over, as if it'd be good news to me, and when I tried to say my say she was quite put out, and said she wasn't likely to refuse a good offer, seeing how badly she was in need. Indeed, Gilbert, mark you that."

"Well, lad," I began soothingly, "she hasn't got used to doing without Jacques' earnings yet."

"That's all you know," he cried. "Why for months before he went off for good, Jacques fooled all his money away, and since he's been gone Iv'e taken care she should want for nothing. Even if we do have to stint now and then, I would prefer that to having that fellow's eyes watching me round the house, and seeing his sneering face opposite me all the evening."

"Come, come, Chris," I interrupted, "he won't stop in all evening, and, while he's there, why not make the best of it. After all, you've no grounds to be set against him."

"And more than that," he went on, taking no heed of what I said, "while we were having supper the patron put in his head to see the upshot of his recommendation and my mother begins to thank him as if she had been starving and he had saved her. Then he comes right in, as proud as Punch of her gratitude and of himself, and sits down and starts off talking—you know his way, first about one thing and then about another—and asking if we'd any news of Jacques and that brought him to the chapter of Celine and then I got up and came away."

"There, there, lad," I said as he paused, that's enough; now you listen to me. If the Frenchman is going to work at the quarry he'll soon know the story of Jacques and all about Celine. So, why not as well first as last? And why should you make yourself a new worry by setting yourself against him in this way. I call it unreasonable."

I thought it wiser to say this, though in my heart I could understand Christophe's prejudice.

"Yes," chimed in my wife, "perhaps you'll end by liking him. And is there any news from Jacques?"

Christophe shook his head sadly.

"I'm beginning to think," he said, "that we never shall hear from him any more. It's six months since we heard last, and the last letter I wrote to the address he gave came back yesterday with 'Not known here' written on it."

"Have you told Celine that?" I asked.

He nodded, then with a fresh burst of indignation, "That was what Pascal started talking of. He thought I should join him in abusing my own flesh and blood."

"Christophe," I began, hesitatingly, for I knew how sore he was on the subject, you can hardly wonder that Pascal abuses Jacques. Any one can see how Celine is pining. The old chap may be a bit simple, but he's the girl's father, and Jacques didn't behave well to her."

"He had no business to talk it over before a stranger," retorted Christophe, and then he marched out of the house as brusquely as he had come in.

"I think it's a pity Celine Pascal hasn't pride enough to leave off wearing the willow for a man who threw her over," said my wife as the door closed. "I used to think she was a girl of spirit, but bless me, she's worse with her trouble than the silliest chit could be."

"Perhaps," I suggested, "if she were a silly chit she'd take being jilted less to heart."

"Don't talk rubbish," replied my wife, "the girl is not only sore because he's played her false. She actually told me the other day that she cares for him still. How can she care for him? Just tell me that."

"But, Marie," I argued, "Jacques was the sort a girl would care for—a right down capital fellow."

"He was once," she rejoined, but he isn't now. Look at the way he carried on before he went off for good. The best thing she can do is to put him out of her head."

"And pick up with some one else," I added slyly.

"Why not," she said; "she'll have a 'dot' and more than one would go wooing her if she'd give half a word of encouragement. And all she does is to pine after a vaurien that's forgotten her."

Celine was to have a wooer, however, who did not require the half-word of encouragement my wife spoke of, whom no show of indifference could rebuff. I learned this from Christophe a few weeks after the Frenchman had come to Rocheaut.

"Gilbert," he said to me one Sunday, as we strolled in the meadow by the river, "Gilbert, just guess what that Frenchman has the impudence to be doing?"

I looked at him in surprise.

"Have you seen anything that makes you think he's after Celine?" he went on.

I shook my head. "I see but little of him out of the quarry," I replied; "he isn't my sort."

"He isn't your sort, isn't he?" he cried angrily. "You were mighty sharp with me for saying that a while back. But whatever sort he is, he's trying to make love to Celine. He watches for her, and waits for her, and dodges after her here and there. He tries to put me off the scent, but I'm quicker than he thinks."

"And Celine," I asked, "what does she say? How does she like him?"

"How should you suppose she would like him? I should think she would hate him. Listen to his talk about things. Didn't you say just now he wasn't your sort?"

"I did; but that doesn't settle the question for the girl he chooses to make love to. He won't talk politics to her."

"I didn't say he would. But you just recollect that it's out of the fulness of his heart a man speaks, whether he's talking politics in a public house or trying to entice a girl's heart away from—"

"Christophe," I interrupted, "I don't want to see Celine take up with the Frenchman—far from it; but she'd do better to give up thinking of Jacques. He gave her up without any just cause; he went away without bidding her good-by, and now he's been gone two years, and after scarce hearing from him at all you've lost trace of him altogether. Any man may woo her and do no harm."

"That's not Celine's way of thinking," rejoined Christophe, obstinately; "she won't give up all belief in him. She helps me to hope a bit, too. She always reminds me what a good lad he was before he got led wrong, and she's sure he'll turn back to his old ways some day and come back to her; and when he comes, she says, he shall have the comfort of seeing that she hasn't lost faith in him."

"My lad," I said, "it seems to me worse than useless for you and her to buoy one another up with such a poor consolation as that."

It was not long before we saw how poor the consolation was, for news came at last of the truant, and with the news all hope vanished.

The news came, too, in a way that we had never thought of—one Saturday night, when a lot of us were sitting in Louvet's inn, while Eugene Louvet read aloud from a newspaper which some one had sent him from Lille. We were all very much interested, for there was a great strike in one of the French colliery districts. There had been riots, which the soldiery had been called out to quell, and many outrages had taken place. In one case, a colliery manager, who had dealt with his men in a summary manner, had been shot down at his own door, and though he was not killed that was mere chance.

After some time the would-be murderer had been discovered, and the trial had begun. It was reported very fully, and the column had been marked by the sender of the paper. Eugene Louvet glanced at it, ran his eye down it, and then looked round at us all with a strange, horrified expression.

"Go on, Eugene," said two or three.

"I can't," said Eugene faintly, taking off his glasses and letting the paper drop on the table.

"Then some one else must," said a voice.

It was the Frenchman who leant across and took the paper and began to read. Considering how fluently he talked, I was surprised to hear how badly he read. He stumbled and pungled, and more than once he had to be told to speak up. Presently his voice got clearer, and the upshot of the terrible story became plain to us all. The accused had not been working very long at the place where the crime had been committed. He had been known there as Jean Dumont, but under cross-examination it came out that this was not his real name. His real name was Jacques Delhogne, and his native place was Rochehaut, in the province of Luxumbourg. The Frenchman raised his eyes and looked around; there was a murmur, but no one spoke audibly. He went on, stumbling worse than ever—I guessed he was thinking of Celine. The accused confessed that he was of the band who had plotted the murder, but he denied everything else—even that he knew who had fired the shot, but the evidence was overpowering. The trial was reported from first to last—for it was a weekly paper—and the sentence was "penal servitude for life."

"Mon Dieu!" said the Frenchman, "penal servitude for life."

And we all sat silent.

"I can't believe it," said Eugene Louvet at last. "The lad had turned wild, but he wasn't of the stuff that assassins are made of. Besides, he denies it."

"Of course he denies it," said the Frenchman irritably; "but look at the evidence. There was no standing against such evidence. The jury was bound to convict. If he hadn't done it he should have proved his innocence."

In an hour the news was all over the village and Celine Pascal knew that she could look for her lover's return no more.

Poor Christophe was a changed man from that day. He lost his readiness to talk, and went about with a stern, resigned face that was pitiful to see. He never spoke of his trouble to me. I doubt if he did to any one, even to Celine.

As to the Frenchman, he took a fresh start in his courtship—in the face of all obstacles.

"He'll have her yet," old Pascal would say, in his confidential moments, "he's a man with a will of his own, I can see, and though he is not the one I would have chosen for her, yet I can't help wishing him luck. Anyhow he's a better bargain than that fellow she hankers after still. I would have had her give him up when he threw her over, and now that he's killed a man, or as good, and gone to prison for life, she ought to see her mistake. Still, she gives the Frenchman no encouragement."

The fact was he wanted no encouragement, and little by little we came to think that his winning of Celine would only be an affair of time; and we were sorry for it.

The summer came round again; Raux had worked with us for a year, and again we had a great press of work at the quarry, and, as luck would have it, the weather was hotter than any one could ever recollect it to have been. All day long the sun beat down into the deep river bend where the quarry lay. The heat quivered over the meadow and above the trees. The foliage hung heavily in the windless air. It would have been hot work to sit still and do nothing. So you may think what it was to have to give up even our dinner hour. We were at the end of our patience as we toiled at the facing, almost naked. I had a rough time as butty, the more so because I set my face against unlimited beer-drinking.

"Confound it," growled the Frenchman, when I had spoken to him three or four times; "drink what you please yourself, and let me alone. If you had to pay for my liquor you might stint it."

You've had too much already," I said, for he spoke thickly, "and I interfere because you're doing your work badly in consequence. You've put a lot too much on that truck, more than your horses can pull, and you'll have to waste time now in taking it off."

"I shan't," he said in a surly tone. "I know what I'm about. I'm not going to make three loads when two will do."

"If you don't take some off," I said, "you'll strain your horses, and that I shan't allow."

"The horses arn't yours," he said.

I felt very angry at him.

"You'd better go outside," I said, "and duck your head in the river, and then come back and look at the thing in your sober senses. I tell you the load's to heavy."

For answer he banged the back of the truck into place, and took the scotch from the wheels. The weary horses gave a great tug, but without effect; the truck slid slowly backward.

"Put the scotch on again," I cried.

Instead of doing it, he sprang forward between the truck and the wall of the shaft and lashed his whip furiously across the head of the hindmost horse. The patient creature made another violent effort. There was a loud sound of metal snapping. The chain which served as a trace had given way on the side further from the Frenchman. I shouted to him, but it was too late. The overloaded wagon swerved from the rails and rushed backward till it jammed by its own weight against the rock before he had time to get out.

"*Le Francais!*" I called, horrified, and a moan of agony came back in answer.

It was some time before we could set him free. When we did, we saw that, though he was conscious, he was in a very bad way. His left side was horribly mangled, and from a wound in his head the blood had flowed over his pale face. We carried him out to the atelier and began to plan for taking him up to the village.

"You needn't trouble," he said feebly. "It's all over with me, and I may as well die here."

We looked at one another. He had never been a churchgoer, but we couldn't let him die like a dog. It was old Pascal who bent over him and suggested sending for M. le Cure. The Frenchman gave a curious start.

"Yes, yes," he said, for the cure and bourguemestre."

"Why the bourgemestre?" asked Pascal. "It isn't usual in such cases."

"For the bourguemestre," went on the other, speaking with difficulty. "I've something I must say—and Celine—she must come, too—and where's the hunchback?"

We thought he was wandering, but Christophe came forward.

"You've never liked me," murmured the Frenchman, "have you?" Then he closed his eyes, and Christophe began to bathe his head with water from the river. "Have they sent for the bourguemestre?" he asked. "Why doesn't he come?"

Celine came before the bourguemestre did. She looked awed and tears were on her face. He opened his eyes and looked at her with a sad, longing look.

"I'm sorry I spoke so hard to you," she said softly. You'll forgive me won't you?"

"Never mind that," he whispered; "the forgiving won't be on my side."

Then the bourguemestre arrived, wondering why he had been summoned, and lastly the cnre, bearing the blessed sacrament, and followed by an acolyte.

We all uncovered reverently, but the Frenchman shook his head impatiently.

"I only want to confess," he said. We were about to move off, when he spoke again. "Stop," he said, "my confession is not for the priest alone. And some one must write it down. It's not a bagatelle that I've got on my mind. He looked round with his old, hard expression, then he summoned all his strength to speak, but his voice failed continually, and only Christophe, Celine and the cure heard all distinctly. The bourguemestre wrote at the cure's dictation. "I tell this because I am dying," he began, "otherwise I should have kept the secret. It was not Mr. Delhogne who shot at Mr. Verrier. It was I. No one knew who it was, though. There were more than twenty of us. We drew lots who should kill him. We agreed not to tell, even among ourselves, who got the fatal shot. It fell to me. I said nothing, but I went and shot him. "Then I managed to get off without rousing suspicion. I came here and hid. I don't know why they fixed the deed on him, but he was taken; and you know the rest. He called himself Dumont. I didn't know he belonged here till——"

He looked round again: Celine had drawn away from him. Christophe had left off bathing his head.

"If it's all written down I'll sign it," he said. "Mind you, if he had had the lot he would have done it. Perhaps he would have shot straighter than I did. But he'll be let off."

A great horror came over us. The bourguemestre brought the paper for him to sign. He tried to raise his head, but he fell back helplessly. Christophe put the pen between his fingers and he scrawled a name which was not Louis Raux, and we all signed as witnesses. Then Monsieur Cure gave us a sign and we all left him alone with the dying man, who showed no signs of repentance. He lingered for an hour or two, but he spoke no more; yet the cure fancied he had softened before the end came.

A little later in the year, Jacques Delhogne, aged and gaunt from mental and bodily suffering, crept back to his native village. For many a long day, however, the terrible sin which he had partaken hung like a cloud between us and him. Slowly and wearily he worked his way back into our esteem. But Celine, who had believed in him the longest, was the last to forgive him.

in a cut, in the coast, by the restless sea. The rocks consist of serpentine of an olive green, diversified with waving lines of red and purple. The hungry waves have torn the cliffs away in fragments, and these are now found pierced by caves, which these same waves have beautifully polished. The serpentine around here has been extensively quarried but the demand was never large and the industry has not flourished. At present the quar-

EDDYSTONE LIGHTHOUSE.

ries are not worked although the material can still be obtained from accumulated stocks. The beach of Kynance Cove is strewed with serpentine pebbles, which have been polished by the action of the waves. A striking object is Asparagus Island with the Devil's Bellows. Here at certain stages of the tide a column of water is violently forced through a chasm in the rock. When, as so often happens, the waves are rough,

LAND'S END, CORNWALL.

OLD LIZARD HEAD, CORNWALL.

ASPARAGUS ISLAND, AND GULL ROCK. THE LIZARD, CORNWALL.

the working of the Devil's Bellows is accompanied with a noise like that of thunder.

"Sighting the Lizard" is an operation well known to all ships bound to Falmouth, a favorite port of call for orders. Its famous harbor receives the waters of 170 square miles of country, and although it is no longer a mail steamer station, something like 1,000 ships a year call at the port. Three miles up a river which flows into Falmouth Harbor is Penryn, the largest center of the granite trade in Cornwall. Here the familiar sound of chisel on granite is constantly heard. Large works have been built, equipped with gantrees, cranes and polishing machinery, and a large number of masons and polishers find employment. The principal quarry in the neighborhood is Carnsew. Carnsew granite is bluish grey, very fine in grain and quarried in large blocks. The feldspar is white, and black and white micas both occur. The Constantine and Stithian quarries produce a granite, coarser in grain than that of Carnsew. From these also blocks of large dimensions are obtained.

Following up the coast from Falmouth and passing Veryan Bay, and the well-known Megavissey Bay, we come to Duporth, not far from which is the little town of St. Austell. The town in itself has little to recommend it, and is said to contain only one subject of interest, viz: the church,

a considerable part of which was built towards the end of the thirteenth century. The tower is really a handsome piece of work and was built some three centuries later. Not far from St. Austell is the Colcerrow quarry which produces granite in enormous masses. It is no uncommon thing for a solid mass to be seen in place measuring 40,000 to 50,000 cubic feet. Colcerrow granite is coarse-grained. The feldspar is white and light green. It polishes well, and a quantity of granite from this quarry was used in the construction of the Plymouth breakwater. Close to Colcerrow is Tregardon quarry, which producesa grey stone of white feldspar, very regularly crystallized.

A railway runs through Cornwall from St. Austell on the south coast

ST. MICHAEL'S MOUNT, CORNWALL.

to New Quay on the north. A few miles north is Luxulion, near which there are one or two quarries producing a grey granite, rather fine-grained, extremely hard, but of jointy structure, and varying color. It is used prineipally for street pitching and kerbs. Boulders of porphyry are found about the moors in this neighborhood. From one of these, of a deep pink color, the sarcophagus of the great Duke of Wellington was made. The block originally weighed 70 tons, and before it was converted into a sarcophagus it cost over $50,000. From Luxulion a road leads to Bodmin, and across the Bodmin Moors to Launceston. South of this road is the curious object known as "The Cheese Wring." This consists of blocks of granite heaped one upon another after the manner of cheese to

AT THE QUARRY FALMOUTH.

A CORNISH GRANITE QUARRY.

the height of some four and twenty feet. The pile looks more like a huge fungus, than anything else, this being due to the fact that the stones at the base are less than half the size of those they support. These latter being some ten or twelve feet in diameter. Close to the Cheese Wring are the Cheese Wring granite quarries producing a stone coarsely crystalline.

A mile south of the Cheese Wring are the Hurlers, three large interesting stone circles, named in accordance with an old tradition to the effect that those same stones were once living men, who once amused themselves by hurling stones on the Sabbath, and for that sin, were turned into stone itself. Of which tradition, an old writer quaintly says, "Did not the ball, which these hurlers used when flesh and blood, appear directly over them, immovably pendant in the air, one might be apt to credit some little of this tale, but as the case is, I can scarcely help thinking but the present stones were always stones, and will to the world's end continue so, unless we be at the pains to pulverize them." Pulverized they have not been by human hands, but the hand of time has not been so merciful, and many of the "hurlers" are now laid low.

Nearer Bodmin are the "DeLank" or "Eddystone" quarries. In color this granite is of a uniform light grey. This was the stone used in construction of the present Eddystone lighthouse. It is shipped at the little port of Wadebridge, a town remarkable for a picturesque bridge of seventeen arches. The bridge is an ancient structure, more than four centuries old, and is said to have been built by the vicar of a neighboring village because of the constant loss of life which took place at a dangerous ferry which was the only means of crossing the river. The De Lank quarry produces large blocks of granite and the proprietors are at present contemplating extensive developements in their industry. *Arthur Lee.*

[TO BE CONTINUED.]

TO OPEN A GEORGIA QUARRY.

AS a result of the litigation that has been pending against the Piedmont Marble Company, Marble Hill, Ga., eastern capital has been combined in a large stock company which will take charge of the valuable quarry and operate it in the future.

The final decree in the litigation over this property was signed Dec. 14 by Judge Newman, of the United States Circuit Court, Atlanta, and a deed will be made to a New York syndicate, which is being formed for the purpose of operating the company's property.

The litigation of the Piedmont Marble Company has been in the United

States court for more than two years, during which time Mr. Percy Adams has been special master and Mr. Alex. P. Hull has been receiver. The property that was involved is very valuable and it is now thought that its operation will be exceedingly profitable to the members of the New York company which proposes to open it again and mine marble for the Eastern and Northern trade.

About two years ago the Piedmont Marble Company contracted to furnish $200,000 worth of marble which was to be used in the construction of St. Luke's cathedral in New York, which was to cost $7,000,000. The marble company failed to furnish the marble according to contract, and Mr. A. J. Robinson, of New York, took charge of the quarry and advanced $206,000 in order to carry out the contract. To secure this money which he advanced, Mr. Robinson was given a mortgage, which was foreclosed last spring after a lengthy hearing of the case.

Last year Special Master Adams made his report to the court, allowing Mr. Robinson to foreclose the mortgage against the company, giving him judgment in the sum of $203,000. Lengthy hearings followed and quite a number of exceptions were filed, but Judge Newman confirmed the special master's finding. He then appointed Mr. Adams master commissioner to sell the property.

The sale of the property occurred August 4, last year, and the property was bid in by Mr. Robinson for $125,000. When the sale was confirmed Judge Newman authorized Special Master Adams to make a deed to a New York syndicate, the nominees of Mr. Robinson. This syndicate, which is composed of wealthy and influential New York gentlemen, has already invested $300,000 in the quarry, which is located in Pickens county, and the marble industry of the state will be given a great impulse by the syndicate.

The property formerly owned by the Piedmont Marble Company is situated near Tate, in Pickens county, and the land is teeming with marble in unlimited quantities. Located on the property is a mill that cost its owners $50,000, and in addition to this there are a number of other buildings, including a hotel.

At the head of the New York syndicate is Mr. E. de Forrest Simmons, while the other gentlemen interested are men of experience.

Many improvements are being projected and the latest and best machinery will be placed at the quarry. The marble will be quarried in vast amounts and the promoters think there will be no difficulty in disposing of the entire output of the quarry.

ROCKS THAT ARE NOW FORMIMG.

THE term rock in Geology indicates any aggregation of minerals, hard or soft, compact or loose. The desert of Sahara is a loose sand rock, so in like manner masses of clay and gravel are designated as rocks. The structure and position of rocks depend upon their origin. The soil and loose earth covering the surface have been derived from wasted rocks. It consists of minute fragments of rock—gravel, sand and clay, together with decomposed vegetable and animal matter. It varies in thickness, never exceeding, however, a few feet. These fragments have either resulted from disintegration of the rocks immediately beneath the surface or from those transported from other localities in which they were broken up. These particles of sand and clay are not always carried away at once by the streams, but remain for a time upon the surface of the hills and in the valleys. But these materials always have a tendency toward lower levels, so there is generally a thicker deposit of soil in the valleys than on the hillsides. The water in the streams is constantly carrying more or less of the loose surface earth to form other rocks beneath the seas. Therefore we may consider the soil we cultivate as merely particles of the old rocks resting for awhile on their journey to the sea.

When rivers empty into lakes the mud they carry settles to the bottom. The waves also constantly erode the shores, and all this sediment is slowly filling the lakes up. The picturesque Lake of Geneva, in Switzerland, is not near as large as in the days of the Romans, A Roman town, situated on the shore of the lake, with its harbor, is now two miles back from the shore, the intervening space having been filled with mud and sand brought by streams from the neighboring mountains. Our belief is, if a large and muddy stream like the Missouri River flowed into either of our Northern Lakes the lake would soon be filled with mud and the river would merely flow through a channel the length of the lake basin. The Mississippi River has pushed its channel far out into the Gulf of Mexico, and at the end of the main channel has formed several tongues of land. On each tongue is a smaller channel, balled a Pass. The one named South Pass had its channel deepened only a few years ago, by the government, so that ships may pass through. Besides mud and sand the Mississippi carries into the Gulf drift-wood and plants of various kinds. Rafts have been formed several miles long by this accumulation, bearing soil and growing trees, but much of the driftwood passes out to sea and is conveyed by marine currents to far distant coasts, or becoming water-logged more rapidly by the action of the saline water, sinks to the bottom of the ocean.

The United States exploring expedition recently have proven conclusively that the delta of the Mississippi contains many layers of wood undergoing the slow process of conversion into coal. The bodies of land animals, such as horses, cattle and hogs are often floated down the great river during an overflow, and to these we add an occasional human body, together with alligators, turtles, fishes, shells, and other organic remains. All these things carried by the river into the Gulf either sink to the bottom or drift upon land and are buried in mud or sand, commingled with many forms of marine life—fishes; shells, corals and seaweeds which live in salt water. When this deposit has hardened into sandstone and shale, and is lifted up to form dry land, the geologist of the future will no doubt find an interesting variety of fossils preserved for his study and delectation.

But let us follow the Mississippi River mud and sand a little further. The mud, floating in the water, is of course carried farther out into the Gulf than the heavier sand, which is pushed along the bottom. Now if the bottom of the Gulf were level, and there was no disturbing marine currents, these would be spread over the bottom, beginning at the mouth of the river, a layer of mud and fine sediment. Over this mud the river current would be constantly pushing forward the sand; this would make two thick layers, a bottom one of mud, and a top one of sand. But there are currents in the Gulf which disturb this regularity of deposition, and, besides, the current of the river is not uniform, it being stronger in time of high water, carrying the sand out over areas which in low water would again be covered with mud. This would make alternate layers of mud and sand. These layers are hardening into shales and sandstones and will present exactly the appearance of sedimentary stratified rocks. The sand will become sandstone, the gravel conglomerate, and the mud will form shale—just exactly such rocks as we are familiar with in the interior states.

One of the most interesting discoveries of modern science was from the soundings and dredging of the Gulf of Mexico from the mouth of the Mississippi to Key West, Fla. At one place sand alone was found, at another mud, and at a third lime or chalky mud—the several materials of sandstone, shale and limestone. We find among the rocks of the interior states many illustrations of this same thing. We see in one county a heavy sandrock over the coal; in another shale or slate, and in another limestone. Thus we see how rocks are continually forming from the waste of still older rocks.

Reflecting on this recalls the impressive exclamation of the poet:

"My heart is awed within me when I think
Of the great wonders which still go on
In silence round me—the perpetual work
Of Thy creation, finished, yet renewed forever."

Oscar C. Salyards.

THE VERMONT MARBLE HILLS.

THERE have been many stories told in this country of selling great fortunes for a trifling sum, but none contains more general interest than that of William E. Barnes, who purchased the great West Rutland marble quarries for an old horse, valued at $75. The hillside and old sheep pasture which the genuine Yankee bought so cheaply contains to-day millions of dollars' worth of rich American marble, and some say that when the full resources of the mine are estimated they will be worth a kingdom. The pioneer in the marble industry of Vermont was not making his purchase blindly, for with true Yankee foresight he realized that marble tombstones would become popular with the masses when the material could be supplied cheaply. For forty years he worked a small kiln on the hillside for burning the marble into lime, and manufactured tombstones as fast as the low rate of mortality in old New England seemed to justify. But he found his death eventually where he had found his fortune, and the block of marble that crushed out his life was then converted into an appropriate monument to mark the resting-place of the pioneer in the manufacture of tombstones from American marble.

Within ten years after Mr. Barnes discovered the wealth of the rocky sheep pasture in 1836, three companies were organized to work the quarries of West Rutland, but they did not make much money. American marble was not considered durable enough to be of much use, and the importation of foreign marble was not greatly affected by the discovery of the quarries in Vermont. Long before this time, even prior to the Revolution, erratic attempts had been made to quarry American marble, and many investors lost their fortunes in the mines. Some exhausted their money and capital just at the point of success, and others found to their disappointment that their quarries were almost worthless. A few workers in the field made money, but fortunes gained in this way were few and far between, except in times within the memory of living men.

The pioneers in the West Rutland marble quarries were no exception to the general rule. There were no railroads in the mountainous districts of Vermont then, and the marble had to be hauled to the nearest shipping point by teams, a distance of twenty-five miles over the roughest and rudest sort of country roads. It cost, according to ex-Secretary of War Proctor before the Tariff Commission in 1882, from $40,000 to $75,009 to get the first salable marble from a Vermont quarry. American marble was slow of

introduction even when the full wealth of the quarries was discovered, and people could not be convinced that it would be as durable as the imported article, although they were forced to admit the durability of its color and firmness. The Italian marble supplied the European demand for all the needs of the trade, and the early builders in this country naturally adopted the same stone for their business.

But fifty years' exposure to the most fickle and trying climate in the world has demonstrated that the marble taken from the West Rutland quarries is more durable than any other. As this fact has become established the demand for the American marble has steadily increased, and in addition to supplying a good part of the home trade, we export a fair amount of marble, especially to Australia. Shipments have been made to London at various times to be used for mantel work, slabs, and tablets in walls, but, owing to the cheapness of the Italian marble there, no large trade has ever been established. While the Italian marble has been conceded by the quarry owners to be superior to American marble for statuary work that is kept in doors, they have every reason for believing that the product of their mines is superior for nearly all other work, especially where it is to be exposed to a variable climate. The Italian marble is harder than the Rutland white marble, but for all that it does not withstand the exposure to the air so well.

The Italian quarries are worked in a primitive way, and the loss is great, although the supplies seem to be inexhaustible. The marble is blasted out and tumbled down the mountains as if it were a worthless boulder, and then roughly dressed and loaded on carts to be carried to the seaports. In the early days of the industry in Vermont the blasting method was employed also, and the saltpetre destroyed many a fine piece of marble. Blasting, of course, is used more or less to-day, but only to uncover the layers of sound marble which lie under those that have been injured by exposure to frost, rain, and sun for ages. Gunpowder opens up the rich layers, and then machinery does the rest. Expensive machinery is employed for quarrying all the marble, and skilled labor has to be employed to operate the machinery intelligently. Even the blasters must be capable workmen, for one false charge might destroy tons of valuable marble.

The first line of railroad to reach the quarries was completed in 1851, and the business may be said to date from that year, for it was then that work was carried on in anything like its present proportions. Many of the large sawing mills run day and night the year around, but in spite of this some ten thousand or more tons of crude marble is shipped to other mills to be dressed for market.

The outcrop of marble and the layers near the surface are seldom of great value, for the action of the sun, rains, and snows for generations past makes it rough, uneven and unsound. In order to secure the finest marble, quar-

ries have to be worked downward, and as the drills penetrate deeper into the layers the quality of the marble improves. The layers of marble are of various thicknesses, and each bed is apt to be different from all the others and the name and quality of the marble are derived from the strata where it is found. At the West Rutland marble quarries the position and relative thickness of the layers are as follows: first, the upper blue layer, four feet thick; second, upper white layer, three and a-half feet thick; third, gray limestone layer, five feet thick; fourth, white statuary layer, three feet thick; fifth, striped layer, one to two feet thick; sixth, new white layer, four feet thick; seventh, wedged white layer, from one to two and a-half feet thick; eighth, muddy layer, four feet thick; ninth, striped green, four feet thick; tenth, camphor gum layer, three feet thick; eleventh, white layer, nine feet thick; and twelfth, blue layer, three and a-half feet thick.

While this is the average thickness of the layers in the Rutland quarries, it varies in other mines, and in places they bear different names. In order to get at these lower layers, which are generally the most valuable, the top layer is removed by blasting, and then the blocks are drilled around with holes. Iron wedges are driven into these holes, and in this way the block of marble is forced from the bed and hoisted out of the quarry by powerful derricks. The drilling is all done by steam channeling-machines, which bite their diamond drills into the rocks twice as fast as the men could do it with the old hand drills. Since the mines become more valuable as the workmen proceed downward, the old quarries are the most profitable until of course, the bottom of the layers is reached. The aggregate thickness of the quarries is forty-seven feet.

When the blocks of marble are hoisted up from the quarry they are carted to the sawing-mills. A marble saw is a smooth edged strip of soft iron, and whole gangs of these are worked by engines of 300-horse power. At West Rutland there are forty-eight gangs of saws, growling and hissing away as they gnaw the stone. The saws have no teeth, but these are supplied by sand, which is poured continually on the top of the block and moistened with water. Marble-cutting in this way is not a modern invention, but it was probably discovered by the Orientals thousands of years ago. Pliny in his "Natural History" describes the process, and makes mention of marble-sawing with sand and iron more than twenty-two centuries ago. The sawing is done in open buildings or sheds, and under this low roof the men are inextricably mixed up with the incessantly swinging saws. Dampness pervades everything, and the mill is not by any means an inviting place to sojourn for any length of time. The machinery keeps up a constant hum, and the saws a hissing and grinding that make the mill an uncanny place. The red-shirted workmen flash back and forth between the vistas of swinging saws, and form a component part of the picture. Outside, the old-fashioned ox-teams are hauling huge blocks of marble from the quarries to

the mill, and near by long lines of loaded trains with the finished products are puffing away from the busy scene toward some distant city or shipping point.

The marble is not only hewn out of the quarries and dressed into slabs and blocks, but it is also worked up into different forms for the trade in the mills. A great number of headstones and monuments are made here, the stones being shaped and polished by machinery and the lettering done by the sand-blast. A few years ago contracts were filled here at the quarries for supplying the national government with 254,000 lettered headstones for the national cemeteries, aggregating an expense of $864,000. The lettering is performed by the sand-blast method after boys have set the inscriptions of the face with metal letters fastened in place with shellac. The miniature sand-storm that then falls upon the unprotected surface of the marble literally cuts the marble away. The quarries also supply an immense amount of thin marble for mantelpieces, furniture, and tablets.

In the cities and towns around here marble is more common than bricks and stones, and there are houses built of it, sidewalks paved with it, and even roadways constructed of the shining nuggets of marble that have been knocked from the large blocks. Vast heaps of marble nuggets tower above the open quarries or accumulate around the mills, and the owners are glad to sell them for whatever sum they can secure. The durability of the marble makes it the ideal building-stone, and in a series of tests with building-stones it was found that seven different varieties of the Rutland marble resisted a temperature of 800 degrees, and three were not injured until the heat was so intense that they were turned into limestone, which meant a continuous heat exceeding 1,200 degrees.

The work of quarrying the marble is continued the year round, and in winter when the ground is covered with snow, dense clouds of black smoke issue from the pit of the quarries, and the gigantic sawing mills present such an animated scene that there is little room for cold to get a foothold. The ox-teams haul the great blocks down the hillside on heavy trucks in summer, but when the snow covers the ground enormous sleds are substituted for them. The scene at its poorest impresses one with the value and importance of this young American industry. The use of marble for building and ornamental work has increased so in recent years that the consumption has more than doubled, and this is not only due to a better appreciation of the beauty and durable qualities of marble, but to the cheaper prices asked for it since the industry of quarrying it assumed its present proportions.

The workmen in the Vermont quarries are paid good wages, the average being about $1.75 per day, and the lowest $1.35 per day. In the Italian quarries the workmen are paid about one-third as much as here, the blasters receiving forty-five cents, and the men who prepare the blocks of marble as little as twenty-five and thirty-five cents.—*New York Post.*

TRADE NOTES FROM GLASGOW, SCOTLAND.

To the Editor of STONE:

SIR:—It is now a considerable time since I had the accidental privilege of seeing your periodical, and it is with extreme pleasure I look forward to the perusal of it on its arrival monthly. I have thought that your readers might be interested in the stone trade in the East and West of Scotland, and a few statements under the above head will be found below.

During the past year the trade has been extremely busy, more especially in the cities of Edinburgh and Glasgow, as well as in the large centers of industry abutting on the latter. The stone for building in Glasgow was (until a few years ago) got principally from the quarries at Giffnoch and Bannockburn, belonging to the firm of Messrs. Baird & Stevenson. It is a fine-grain stone of a creamy color, but is not so good a weather stone as builders could wish. Many of the principal buildings in Glasgow are built with this stone, the last being the magnificent pile of Municipal Buildings erected by the corporation. The fashion during the last few years has changed completely, the red stone from Dumfrieshire having been introduced. This stone has nearly superseded the white and the railway companies have given great encouragement by allowing very cheap freight for conveyance.

Stone for the principal buildings in Edinburgh is got from the north of England, the county of Northumberland supplying large quantities of nice yellow stone of which there is a large area workable, but has the great drawback of being (generally speaking) far from railway communication.

Mason's wages have not reached the height of those paid during the speculative building boom preceding the failure of the City of Glasgow Bank, but they are so high, as well as a scarcity of masons, that contractors are putting up stone-working machinery on every hand. We seem to be a long way behind in machinery, and I think it would be well for your manufacturers to introduce their stone-working machinery here. Hitherto contractors and builders have not had the same inducement to introduce machinery as their brothers in the States, but if they want to get on they must do something.

Quarriers as a rule are paid 6½ to 7 pence per hour and have been busy the year around with fairly good weather (little frost) up to the time I am writing. Here again improvements in working are visible. Wire cutting arrangements have been introduced (I am not yet aware with what success) into Locharbrigg's quarry by Baird & Stevenson, who work a red stone there. I paid a visit the other day to a large producing center at Auchinlee, Cleland, about sixteen miles from Glasgow, where I saw at work two Ingersoll-Sergeant track channelers, as well as a bar channeler by the same firm. Although the stone produced here is not of first-class quality, still the output is such that it is the largest producing stone district in Scotland. The firm of Messrs. Thos. Gibb & Sons, which is composed of three brothers, of whom the eldest, Richard, is the manager, informed me that it was through your paper that they first got onto the idea of channeling stone. The machines are doing splendid work and although the stone is soft Mr. Treglown, Jr., who superintended the starting of the machines, looks forward to his company getting large orders for these machines shortly. The Messrs. Gibb are thoroughly satisfied and the most of the principal quarry owners have been seeing them at work. This firm has been largely successful by their policy of go-ahead instilled into

them by their late father, who from a working miner rose by his own exertions to be one of the principal quarry and brick masters in the West of Scotland, and was largely interested in the public bodies governing the local affairs of the parish and district. His son is a Justice of the Peace and has succeeded to his father's position in School Board and Parish Councils. Walter and Cumming look after the commercial business of the firm. Here again they have introduced brick making machinery to make the clay on the top of the rock into brick, making about 20,000 daily with plans in preparation for increasing this to 40,000. They have been seeing a "Simpson" press (largely used in the States), but they have not their clay thoroughly tested as yet to warrant them introducing it. Altogether, my visit to this district well repaid me and I look forward to another visit with pleasure.

Wishing you the compliments of the season, and prosperity to your journal, I am, yours sincerely, BANNOCKBURN.

Glasgow, Dec. 26, 1896.

A PIONEER WESTERN QUARRYMAN.

HORACE M. SINGER, one of Chicago's oldest residents, and who twenty years ago was looked upon as a leader in business and political circles, died Dec. 28, at his home in Pasadena, Cal. His illness was of two weeks' duration, but his death was not in the nature of a surprise to his relatives and immediate friends.

Mr. Singer was born Oct. 1, 1823, at Schenectady, N. Y. While an infant his parents moved to Ohio, settling on the Western Reserve, in Ashtabula county. In October, 1836, they moved to Illinois, his father having a contract for the construction of a portion of the Illinois and Michigan canal. Young Horace helped his father on this work until its suspension in 1840, caused by the state defaulting. Horace then bought a team and engaged in freighting between Chicago and points within a radius of 125 miles in Michigan, Indiana and Illinois. In 1845 work was resumed on the canal by the trustees for the bondholders. From the position of axman he rose to that of superintendent of repairs. He continued his connection with the canal until the opening of navigation, in 1852, when he engaged in the stone business, which he kept up until twelve years ago, when he retired from active business. In 1854, he became associated with Mancel Talcott, now deceased, under the firm name of Singer & Talcott. This partnership was continued up to 1872, when the Western Stone Company was organized, with Mr. Singer as president. Aside from his business life, Mr. Singer was prominent in politics thirty years ago.

[Regular Correspondence STONE.]

NOTES FROM ABERDEEN.

To the Editor of STONE:

SIR:—The scheme for technical and artistic classes in granite working is progressing. The governors of Gordon's College, in this city, have agreed to admit pupils at the ordinary fee for the arts classes at the Gray School of Art. These scholars will be taught modeling in the usual way—the collection of casts being, I may safely say, thoroughly up to date—and, in addition there will be workshops for training purposes in stone-cutting, so far as regards granite, which is the staple export industry in this quarter. The workshops will be under the care of a committee in charge, composed of bodies subscribing to the end in view. The Aberdeen Granite Association, (composed of employers in the monumental trade) and the Aberdeen branch of the operatives in the same industry, have each agreed to subscribe £25 per annum. Stone-cutting in the class-shed will first be devoted to decorative work, which is expected to lead up to allegorical statuary work.

The year ended has been a prosperous one for all branches of the granite trade here, except the American part of the monumental business, which has been decidedly dull all along. There have been three failures in the local monumental trade, making nine within two years. An effort is, however, being made to raise prices to a reasonable business level. Despite the falling-off in the American trade, the total output of polished granite this year has been considerably above that for 1895. From Aberdeen harbors alone the polished granite exports showed a rise of 1030 tons. The large amount of housebuilding in the city caused a great demand for building stones from the local quarries, and an exceptional amount of paving also went on in Aberdeen. Seven new quarries were opened—or strictly speaking, seven old quarries were re-opened—in Aberdeenshire during the year—one producing a red granite, the others gray granite. The total value of the Aberdeen granite trade this year is moderately estimated at three million dollars, but masters' profits in the building as well as the monumental trade have been reduced by competition to a low rate.

The outlook for next year in the granite trade is hopeful as regards all departments. We expect the United States to settle down to business and send something worth speaking of in the shape of orders in the monumental way.

A new theatre is to be built in Rosemount Viaduct, Aberdeen. The external walls will be of granite, and the building will be fireproof throughout. The "People's Palace," the music hall which was burned down, is also to be replaced by a fireproof building.

One of the Aberdeen monumental masters has booked the order for the granite work in the City Square improvemens scheme, in the town of Leeds, England, comprising balustrade and two lavatories, the contract price approaching $4000. In the center of the space inclosed by the balustrade will be a bronze equestrian statue of Edward the Black Prince (total height including pedestal, 30 ft.), Mr. Thomas Brock, R. A., London, being sculptor. There will also be four pairs of allegorical bronze figures—"Morn." and "Even."—a pair at each entrance, from designs by Mr. Alf. Drury. The statue and figures are the gift of an alderman, and another alderman is to present Leeds with an ornamental fountain for the same square.

There seem to be more stone-cutters idle in Aberdeen just now than usual at this season, but this arises from the quarries being unable to meet the demands made on them. There has also been a snowstorm in the inland districts. That reminds me of the fact that there was practically no winter in the beginning of this year—a circumstance to which the success of the granite trade in 1896 is largely due.

A wall monument in black and red granites has just been finished here and will be erected in Nellfield cemetery, Aberdeen, to the memory of the late William Alexander, L. L. D., author of "Johnny Gibb of Gushetneuk," a unique work on rural life in Scotland, which had a large circulation on your side as well as here. The memorial is the result of public subscription. It is 12 ft. 2 in. high by 6 ft. 3 in. broad. The granite is all dull-polished, and in a niche is a bust (bronze) of Dr. Alexander by Mr. Pettendrigh Macgillivray, A. R. S. A., Edinburgh, who designed the granite work also. In front of the die is a bronze medallion of "Johnny Gibb" and a laurel wreath designed by Sir. George Reid, P. R. S. A., who illustrated the deceased's literary works. Dr. Alexander was long a journalist in Aberdeen, and was latterly editor of an evening paper. HEATHERBLOW.

Aberdeen, Scotland, December 31st, 1896.

IMPORTS OF STONE IN PAST THIRTEEN YEARS.

THE Treasury Department reports the following as value of imports of stone, marble, granite and slate for the years named:

1884	$ 950,216.79
1885	874,527.53
1886	898,194.47
1887	960,981.64
1888	976,622.56
1889	1,005,484.00
1890	1,313,056.11
1891	1,376,532.32
1892	1,401,349.29
1893	1,750,498.97
1894	1,186,864.96
1895	1,255,001.26
1896	1,347,483.46

A NEW SERPENTINE DISCOVERY.

To the Editor of STONE:

SIR:—It may be a matter of interest to your journal to record the finding of a new deposit of serpentine of fine quality in the southeastern part of York county, Pennsylvania. A polished slab, as well as rough pieces, were brought to me for inspection a few days ago and in general appearance they closely resembled verd antique. It would hardly be called such, however, since the white interpenetrating mineral is not limestone. The latter I have under examination and will make a chemical analysis of it. The serpentiue is of a dark rich green color; the polished slab was beautiful and would be fine for indoor decorative work. There is said to be five acres of land on which the rock occurs. The find was made by Mr. W. A. McLaughlin, of Delta, Pa.

York, Pa., Dec. 11, 1896. Very truly, C. H. EHRENFELD.

OUR FOREIGN TRADE IN STONES, ETC.

From the summary statement of the finance, commerce and immigration of the United States, corrected to December 4, 1896, we compile the following:

ARTICLES.	OCTOBER.				10 MONTHS ENDING OCTOBER—			
	1895		1896		1895		1896	
Imports—	Quan.	Values.	Quan.	Values.	Quan.	Values.	Quan.	Values.
Cement, Rom., Portland & other hydraulic...lbs	112,585,677	*Dollars* 354,124	104,416,295	*Dollars* 327,802	984,524,074	*Dollars* 3,189,035	941,602,200	*Dollars* 2,987,380
Cement, imp. from (lbs.)								
United Kingdom	33,975,890	102,032	34,040,407	109,927	232,154,862	723,854	224,794,868	718,748
Belgium	26,338,101	76,010	25,773,789	71,074	237,660,350	730,853	244,554 478	712,253
France	198,414	441	983,668	3,287	8,310,296	25,550	16,845,353	46,810
Germany	49,604,746	166,042	40,898,920	134,940	447,494,449	1,500,815	429,932,314	1,416,396
Other Europe	1,863,776	6,881	2,418,711	7,264	52,437,397	183,828	20,702,087	72,532
British North America	604,780	2,718	300,800	1,310	3,844,480	17,269	3,551,500	14,989
Other countries					2,622,240	7,366	1,221,600	5,652
Total	112,585,677	354,124	105,416,285	327,802	984,524,074	3,189,035	941,602,200	2,987,380
Marble, and mfrs. of		85,701		75,130		703,504		716,776
Stone, & manufactures of, including slate		37,694		31,428		344,664		337,868
Total		123,395		106,558		1,048,168		1,054,644
Exports—								
Marble and stone, and manufactures of:								
Unmanufactured		9,268		3,888		60,433		58,043
Manufactures of—								
Roofing slate		25,235		41,500		56,953		374,538
All other		64,750		58,870		709,138		486,561
Total		99,253		104,258		826,524		919,132
Cement.....bbls			3,892	7,547			48,290	75,682
Exports foreign mdse								
Cement, Rom., Portland & other hydraulic...lbs	369,829	1,449	698,411	2,530	2,778,418	10,932	3,962,990	14 889
Marble, & mfrs. of				1,678		955		2,963
Stone, & mfrs. of including slate		2,073		863		3,459		8,617
Total		2,073		2,541		4,454		11,580

Merchandise Remaining in Warehouse on October 31, 1895 and 1896, Respectively.

ARTICLES.	October 31—			
	1895.		1896.	
	Quantities.	Values.	Quantities.	Values.
Cement, Roman, Portland, etc.....lbs...	4,119,965	$ 11,961	15,903,026	$ 46,806
Marble and stone, and manufactures of:				
Marble, and manufactures of		64,629		33,940
Stone, and manufactures of, including slate				773
Total	4,119,965	$ 76,590	15,903,026	$81,519

GOOD ROADS.

JOHN HAMILTON, deputy secretary of agriculture in Pennsylvania, and director of farmer's institutes, who is leading the movement in Pennsylvania for good roads, has a scheme to meet the objections to the movement based on the score of economy. As he looks at the matter, the country districts, while needing good roads, do not need to have the road tracts as wide as in more largely traveled districts. His plan is to make all roadways in sparsely settled districts not more than seven feet wide six and one-half inches in thickness of broken stone on its surface. Taking the cost of the stone at 9 or 10 cents a cubic yard before crushing, he estimates that stone can be crushed for 18 cents a yard, and broken stone can be put down on the roads at points not more than a mile from the crusher at 38 cents per yard, making a total of 65 cents per yard, or about $500 per mile for the dimensions named. Maintaining the present expenditure of about $49 per mile, this would allow the roads to be paved in about 10 years.

The Folly of State "Tariffs." The distinguished nominee for the presidency who stated in his letter of acceptance that "tariff was a local issue," and was derisively laughed at, and ingloriously "snowed under" on that account, were he living to-day might produce overwhelming evidence of the truth of his declaration, at least so far as "local issues" are concerned. Since his day there has come from nearly every section of the country one or more "issues" that have involved the taxation of the industries of other sections. Take, for instance, the "tariff" on the stone industries that seek a market in New York. They are shut out from competition in the manufactured product. Their raw material may go in free, but they must cut and prepare it for public buildings on the ground, or it doesn't go in. That's a tariff in favor of the home producer and for the benefit of organized stone-cutters —and "the consumers pay the tax." The same system prevails in other states. So we find throughout our glorious Union that a "tariff is a local issue" when it comes to dealing with ourselves as a community alike interested in the national welfare. Across the border line of states stands the impregnable barrier of selfishness incorporated into costly law—a law that robs Peter to pay Paul; that encourages corruption in office and jobbery in high places; that takes the bread from the mouths of the workingmen in one section that it may be put in the bellies of workingmen in another section—and all of this in the name of "home protection," as if such a thing as that were justifiable in the inter-commerce and trade of these *United* States. The insolence of this sentiment has never appeared in a more expressive manner, than in the proposition that the national government shall adopt it in selecting the material for its buildings. Who pays for the work of the government? Not the people of any one state, only. Why, then, should the national government put a prohibitory tariff upon the product of any other state for the benefit of the product of the state in which it intends to erect its own building? If it comes to pass that the congress shall enact a precedent of this nature, granting that it has the constitutional power to do so, where will such legislation end? If the use of Indiana stone may be prohibited for the government building in Colorado, as the newspapers and congressmen of the latter state propose, isn't it as reasonable to propose that the government shall only patronize the ranchmen and grain-growers of that state for the supplies of the garrisons it maintains therein? And to carry out the principle to its logical sequence would the national government be allowed to go outside the boundaries of any state to get the thing it needs for its own purposes within that state? It is the very climax of folly to even suggest such action. The decree of state legislatures making it impossible for the granite pro-

's of New England, or the stone con-
ors of Ohio, Indiana and other states
nd material into their states in a
ufactured form, has hurt the inter-
trade of such states immensely.
e it has protected the stone and
te cutters of those states to a certain
t, it has increased the tax rate,
d the use of inferior stone, turned
trade from its merchants and man-
urers, opened the way to contract
ry and the misapplication of public
ues, and encouraged a reprisal on
roducts of such states that will be
iced so long as the nefarious "tariff"
of those states remain unrepealed.

Use of e. The introduction of granite as a material for monuments has cally displaced marble for that pur-
This result has not been so seri-
the marble interests as it was first
it would be. In truth we think
been a good thing for the marble in-
ies, as well as an improvement to our
eries. In the old days, when mar-
vas the chief material for monu-
, there was little to be seen above
commonplace in artistic designing
nposing feature. The substitution
anite has made it possible for the
mental architect to design more con-
ous memorials and loving friends to
them. So our burial places are
ally taking on a modern aspect, in
art is given some demonstration
titude of expression. This follows
se granite being more variegated,
ter weathering quality, more mas-
n appearance and withal cheaper,
naturally superseded the finer and
stone for this purpose, and being
xpensive the builder is able to erect
imposing memorials. This dis-
ment of marble has had the result of directing the efforts of marble producers and workers toward the building trade—at first to interior uses in tiling, stairways and columnated work, then to mural effects and on to the construction of the façades and walls of buildings. The result has been pleasing all around. Our residences, our temples of commerce and our imposing capitols, colleges and cathedrals, have created a demand for marble largely in excess of any loss the industry has sustained by the retirement of trade in monumental works. All this, we believe, has been an advantage to those engaged in the marble trade, as it has certainly been satisfying to the refined, progressive sentiment of the times.

Advice on Advertising. The calendar crop for 1897, is not prolific as in past years. The fad seems to have met a chilly set-back, as it were. It may truthfully be said of this species of advertising that "it costs more than it comes to." A calendar that remains during the year a conspicuous feature of mural decoration must be of exceptional high merit in an artistic sense. The commonplace production, (and such are most common) soon pass out of sight. The shoddiest of these is expensive as compared with advertising in publications of large circulation or high merit. The amount put into a calendar, if divided among magazines and newspapers, would return a much greater percentage of profit in advertising results. Conviction on this fact may partly account for the few specimens that have been issued for this year. The aversion to spending the money that is so hard to get nowadays in picturesque advertising is also one reason fot the short crop of calendars, but the mosr absurd of reasons for refraining from ad-

ising in the legitimate way. It ild have been much better for the con- as which withdrew their advertising m the magazines and newspapers to ve cut their operating expenses in me other way during the dull business ason. It is only necessary in proof of his to consider what has been done by he firms who "kept everlastingly at it" in the public prints. They have, without exception, grown during the stunted times, while probably most of those who hauled in their signs during the foul weather, have to redouble their energies and outlays to regain their former prestige as fair-weather business concerns.

There's as much sense in advertising to hold business as there is to gain new business. That's the policy of the proprietary medicine man, and it holds good with the manufacturer of patented machinery, or the merchant who traffics in natural products.

To advertise with profit keep incessantly at it, and never confess weakness by cutting down the amount of space required to do it effectively.

Capable Managers in Demand. Hard times nor "soft" times, destroys the constant demand for capable men to manage big business concerns. The "fit" man is always master of the situation. His services are hard to secure, because the firm that has a claim upon them, does not willingly relinquish him for any consideration it can possibly meet. STONE is not in the employment agency business, but it has frequently been requested to find first-class managers for prominent quarrying companies, who stipulated their needs to be for the very best man that a fat salary and a comfortable berth would tempt to enter their service. The qualifications always mentioned are that acceptable parties should possess practical experience in the business of quarrying; executive ability in the management of men; understanding how to prevent losses in operating affairs; how to overcome the effects of unexpected losses by providing measures that lessen the chances of recurrence; who are good business men, by that meaning how to produce the material per order at least cost and in best form. They do not want to hear from men who consider themselves simply foremen or superintendents of quarrying. They want to hear from men who are qualified in that respect, but beyond that, also, men who can *manage* the business in every sense, except to pay bills, collect the accounts, pass upon credits, and who will not undertake to boss the head boss.

Our Frontispiece. A half-tone reproduction of S. A. Forbes' famous painting, "The Quarry Team," is given to delight the subscribers to STONE this month. Franz Hanfstaengl, art publisher, of New York, kindly allowed us to reproduce this from his large and elegant photogravure from the original painting. We suggest that a quarryman who delights in fine pictures, could frame none more pertinent and beautiful than the photogravure from which we take our frontispiece for this number of STONE. It can be procured, we think, for $5.

Foreign Trade in Machinery. A well-directed effort on the part of our manufacturers of stone-working and quarrying machinery would insure a profitable trade with European firms. Our correspondent at Glasgow, Scotland, refers to this suggestion in his "notes" in this issue. While there are a few things new to the trade on this

that are successfully used in the ies and stone-mills of Europe, they r behind us in the general equip- The channelers are practically own adjuncts in most operations the steel derrick and modern hoist- ngine are rarely seen; blasting sys- of latest pattern are unheard of; the notive crane, steam traveler and ca- y are seldom found in use. What e of European countries is confirm- greater force by reference to the countries of South and Central ica, where the little comparatively is executed in the most primitive er.

Farcical Contract Letting. There's a good deal of low comedy in the procedings of g a contract for the stone work of etroit courthouse. (It may turn to ly before the last curtain goes). The audience is getting no end nusement out of it. The actors on board" and the aspiring stars who lamoring for first place in the cast n a frenzy. Now, there is nothing ordinary in the *ensemble* of the com- but there is profound mysticism in lot of the play. There are a half- or more "star" stone companies, ny "heavies" in the role of con- rs, a band of fifty-three supervisors constitute the jury, a judge or two, vocate for each "star" and "heavy," he dog-star of the Michigan stage, o Pingree, as boss of the show, en- in the performance which has been on uninterruptedly for months. r the play is over" Wayne county robably have a courthouse which uld gladly dump into the river, if it

s performance illustrates a lesson in act-letting that could be profitably studied by the people who intrust the responsibility of their affairs to political spoilsmen. Consider a moment the proposition that empowers a board of a half hundred ward and township politicians to select the plans, material and furnishings of a great public building; surround these men with temptation to earn a fat fee to vote for the selection of a material they don't know a thing about and care less! What other result can the people expect than just such tangles as we now find over the letting referred to? It seems to us a way might be found to dispense with this method of arranging for the construction of great public works. If legislatures may provide for commissions to institute and control public parks maintained at the expense of the taxpayers of the cities thus enriched, they might empower the appointment of a commission of architects and builders to select the plans and material for city and county buildings, and surround that commission with such obligations that none but competent and honest men could serve thereon. This would strike away most of the jobbery that has become inseparable to the letting of contracts under the loose system now practiced.

Quarryman and Quarrier. There is no difference in the definition of the nouns "quarryman" and "quarrier," as given in the standard dictionaries. This leads to confusion in writing about the operator or the operative of a quarry. STONE, though not over-brilliant in lexicography, will hereafter define a quarryman as one who owns a quarry, and a quarrier as one who works in a quarry. This definition, it is hoped, will be adopted by contemporaries and authors when they use the terms. We might go farther and institute a clearer definition than at present exists in referring to a

stone-cutter—one who cuts stone, and the man who owns a stone-cutting plant, who is likewise often alluded to as a stone-cutter, though practically he doesn't cut stone. He is a contractorf manufacturer or merchant in stone. STONE will hereafter refer to him as a stone-dealer, which term embraces each of the qualifications mentioned, unless, to the point, he is specifically either of the others and not a "dealer" in fact. The term "dealer" is thus used to define the noun proper when reference is made to the dealer in granite, marble and slate, and hence there is no consistency in dropping it from common use in referring to the stone merchant, manufacturer or contractor when he is all of them in one—a "dealer."

Is There Trouble Ahead? It is reported that measures are well under way looking to the organization of a National Union of stone quarriers (operatives). There was, and we presume there is yet, an organization known as the "Quarrymen's National Union," composed principally of operatives engaged in quarrying granite in the New England States. It never became much of a power among labor organizations and is practically defunct, if not positively dead. This movement toward a new union originated among the quarriers of northern Ohio, and is the outgrowth of the late conflict in that section between the quarrymen and their employes. There are 25 local unions in that section with an average membership of 100. This is a pretty substantial nucleus for a national union, and we do not believe there will be much difficulty in getting an alliance with other local bodies throughout the country, or in recruiting practically the entire force of men engaged at work in the quarries. It is reported that the initial move of the perfected organization will be a per capita levy for strike purposes, called a "defense fund." That means trouble from the start. An organization cannot be bent on peaceful purposes, if its first inspiration is to prepare for war, when no challenge has been offered it, notwithstanding its motto is given out as "Defense, not Defiance." If the purpose be to engage the power of a national union in defense of a local union's grievance, it is Defiance with a big D, and the quarrymen of the country should at once prepare for the combat.

What has become of the Quarrymen's National Association, that was so brilliantly conceived and treacherously mismanaged a few years ago? Can it be revived by earnest men, and given into the direction of honest and capable officers now? It may be necessary for the defense of the quarrying industry that such an organization shall come forth.

SELECTED MISCELLANY.

HOW EMERY IS QUARRIED.

-OPERATORS may be pleased to know that among the few trades of the world hands of the laborers is that of the emery yman. Emery comes from the Island of s, in the eastern Mediterranean, whence it een exported for the last two centuries or

The beds are in the northeast of the , the deposits descending into some of ighboring islands, the emery being found ticular masses, resting on layers of schist nestone, almost identical with Parian e, the finest marble known, which comes he island of Paros close by.

re are about 300 men engaged in the all of whom have to be married before are admitted to the fraternity.

The material is much too hard to be dug out, or even blasted. Great fires are lighted around the blocks till the natural cracks expand with the heat and levers are then inserted to pry them apart.

This system is continued until the blocks are reduced in size to masses of a cubic foot or less, and they are then shipped as if they were coals. There are said to be 20,000,000 tons yet available at Naxos, and last year's export was 3,950 tons.

It is one of the hardest substances yet known, coming next to the diamond, and among its crystalline forms known to the jewelers are the ruby and the sapphire.—*Pearson's Weekly*.

THE "CAPITALIST" DELUSION.

E of the worst of our delusions is that the capitalists or employers are a peculfavored class; that nature has done somefor them which she has not done for the the world. The word "capitalist" is r word for the man who saves, and who nt what the public will buy. This facr saving and for finding out what the wants is a rare faculty. It is so rare, believe reliable statistics prove that -five per cent. of men in business—that nen who employ others—fail. They fail gh their incapacity or want of diligence. n infinitesimally small number of them e fortune. They may be called the exs of the race. We profit by their errors. ne who invents a sewing-machine or a one, ten thousand lapse into poverty. ng requires a more delicate combination lities than the creation and conduct of a business. The conditions of success are too minute for observation. The life is f terrible anxieties, especially in what is called "hard times," when money is difficult to get. The penalty of failure is tremendous, and yet the number of us who are ready to tell the capitalist how to carry on his business, how to pay his men, whom to employ, and on what terms, is very large. If those who carry on business themselves were only one-thousandth part as numerous as those who can tell how it ought to be carried on by others, the happiness of men would be assured. I do not discuss what is called profit-sharing, because it is one of the things to be sought by the persons concerned, not to be forced on anybody. Its success depends on the voluntary action of employer and employed, hardly at all on the exposition of it in the books by persons who have no practical experience of it.

* * * * * *

There are few occupations whose nature prevents those who pursue them from being agreeable company to people who are simply richer. A very large proportion of what are called "the business men" know no more, read

no more, and have no more to say than the bricklayer or the plumber; but they are apt to have better taste and better surroundings, and to pay more attention to dress and personal cleanliness. Other people similarly situated, for these reasons, prefer their company. There is no doubt that in these respects there is room for great improvement in the habits of the working classes, but this improvement must come from themselves. Nobody can impose it on them. It must be the outcome of personal desire or ambition. Any agency which helps to implant this desire or nurture this ambition is a good one. Improvement in dwellings undoubtedly does this; better education does it; increased opportunities for harmless or intellectual amusement, and the use of them, does it too; slowly, perhaps, but surely. In this field the more unfortunate classes cannot labor without result.—*E. L. Godkin in the December Atlantic.*

STONE-CRUSHING PLAN.

F. H. RICHARDS, writing to the Hartford (Conn.) *Courant*, makes the following suggestion:

"Now that the public interest in good roads has been renewed I wish to call the attention especially of the selectmen of our towns to the importance of adopting rock crushers mounted upon wheels, so as to be readily drawn over the road and used at the place where the work is to be done. This plan will save a very large part of the expense now generally incurred in hauling material to and from the crushers. Of course the engine and boiler for operating the crusher would be carried on the same truck and also furnish the power for propelling the apparatus from place to place. For use in country districts the boilers ought to be arranged to burn wood.

"The general abandonment of stone and timber fences in favor of wire fences in many locations makes available the old stone walls along the roadside, the stone of which might be crushed on the spot by a portable steam crusher and thus furnish sufficient amounts of road material without hauling from a distance or bringing from a distant quarry anything more than the top dressing. In driving through some portions of the state I have noticed half buried walls along the roadside which have ceased to be used as fences but contained an abundance of material for making a thoroughly good macadam road-bed.

"By adopting this and some other obvious expedients in the same line, it is quite certain that the building of the roads will in many localities be so materially reduced that the towns can carry on the work at a profit without either state or country co-operation, since every rod of the new road built will lessen by so much the extent of necessary annual repairs.

"Our people seem to be agreed that we must very soon rebuild all the principal thoroughfares through the country districts. The importance, therefore, of facilitating the work by bringing into use more effective mechanical appliances is very great."

EMPLOYER'S LIABILITY FOR EMPLOYES INJURY.

THE United States circuit court of appeals, in an opinion delivered by Judge Putnam, reversed the judgment of the circuit court for Rhode Island in the original action brought by Peter Roynolds, administrator of the estate of his son, Peter Reynolds, against Charles P. Chapman, and remanded the case to that court for further proceedings not inconsistent with the opinion.

The judgment of the circuit court for Rhode Island was for the plaintiff, Reynolds, against the defendant, Chapman, and was based upon a verdict of $1,000 which the jury awarded him.

The action was brought by Reynolds, administrator of his son, who was a quarryman in Chapman's employ, under the Rhode Island statute, making a person who commits a wrongful act which inflicts injuries upon another liable in damages for such injuries if an action for damages could have been maintained at common law had death not ensued to the injured person.

Reynolds' son was one of a gang of men who

erating a derrick at the defendant's and he was fatally injured by the fall rtion of the rock which formed the ge of a "Blondin," an apparatus used ng and moving stone out of the quarry. Blondin" was at the time in charge of ith, who also was an employe of the nt. The defendant asked the judge at l in the circuit court to instruct the t if the accident to the plaintiff's intes- s due to the negligence of Smith in the "Blondin" into operation while the 's intestate was under or near it, the could not recover, because Smith and intiff's intestate were fellow-servants. quest for instruction was refused, and endant, Chapman, excepted.

court holds that the Rhode Island stat- s no right of action unless the circum- are such as to constitute the basis of a suit at common law; and that who are fellow-servants at common law is a question of general jurisprudence as to which the federal courts are not generally controlled by the local decisions, and that the deceased and Smith were clearly such are the results of many adjudications of the United States supreme court. It also states that whether Smith failed to comply with the instructions in regard to the operation of the "Blondin," if he received any, and whether such failed, if it existed, was the true cause of the injury to the deceased, were both questions arising at common law, with reference to which the jury should have been properly instructed. And it concludes that, for want of such instructions in regard to the common law doctrine, the employe cannot recover from his employer damages for an injury sustained as a result of the negligence of a fellow servant, a new trial must be granted.

TRAINING SCHOOL FOR GRANITE WORKERS

ING a recent visit to Aberdeen Mr. ittendrigh Macgillivray, A.R.S.A., had interviews with the members of the Association, who are taking an interest roposed scheme for the more efficient ning of granite workers. Mr. Macgilli- greatly impressed with the possibility ding the use of granite for public deco- urposes, not only at home but abroad, ecially in the colonies and on the con- but he holds that before much can be the way of developing the more artistic the industry, there must be established ent system of instruction, combining art hnical training, including designing deling, and the reproduction of models e "quality" and style of sculptured For this purpose he proposes the establishment of a school of instruction for granite cutters. In Mr. Macgillivray's opinion, there is a great field for the granite industry if this new movement for its more artistic treatment is earnestly gone into both by the masters and the men. It may be added that Mr. Macgillivray favors reddish granite rather than white for artistic purposes, and that the method of finish which he favors is the "dull rubbed" surface. He is against both the "hacked" and the polished surface, holding that the dull rubbing which was adopted by the Egyptian granite workers is the true method of treatment for conveying the desired impression of hardness, solidity, and massiveness and also for securing the best effects of light and shade.—*Extract from Aberdeen Journal.*

SATYR AND SATIRE IN MARBLE.

O DOBBERTIN, the San Francisco culptor, has recently completed a piece that provokes much comment in artistic

he bust of a satyr, who holds his head d smiles at a little cupid standing on t the foot of the pedestal and reaching les the throat of the satyr with a straw. The satyr looks as though he were born to be pleased, and the little cupid seems exerting every effort to do so. The smile of the satyr is so self-satisfied and the expression of the cupid is so anxious that the effect is droll.

Dobbertin says he never molds anything from the plastic clay unless there exists behind his fingers a well-defined feeling or thought that

needs external fixing. It is perhaps this that makes the sketch of the satyr and the cupid particularly interesting and renders it a delicate piece of good-natured satire. In fact, there is a story connected to it.

When Fred Yates, the English artist, was in the city a short time ago he visited Dobbertin's studio. He looked at the "Degeneration" and was delighted. He fixed his monocle to his right eye and gazed on the "Kiss of Death."

"Dobbertin," said he, holding his head back and smiling while he laid his hand patronizingly on the shoulder of the sculptor—"Dobbertin, my boy, it is true you are an artist."

The words were sincere enough, but the tone and the attitude were of the nature that makes the full-grown man feel like a little boy when he listens to them. The tone tickled the sculptor exceedingly, as he said afterward.

It tickled him so much that he began to imagine the real feeling in the mind of the great painter. The thought became very strong in his mind, so strong really that as soon as Yates had departed, Dobbertin rushed to a lump of wet clay and began with facile touches to show his fellow artists how he felt.

When a brother artist came in soon after, he looked at the sketch a moment and said: "A satyr's nose is not bent that way, Dobbertin," and after looking at it longer, said: "Oh, that's Yates," and so Dobbertin has perpetrated a pun in marble. He has good-naturedly satirized the feeling of infallibility in an English artist.

THE TWO GREAT FACTS OF THE LABOR QUESTION.

THERE are two great facts [says Mr. Godkin in his Article upon "Social Classes in the Republic," in the December *Atlantic*] which lie at the bottom of this labor question, which it behooves all reformers to remember. One is that as far back as our knowledge of the human race goes all that the earth has yielded to the labors has been a very moderate subsistence. In every country and in every quarter of the globe, the mass of the people have been, and are to-day happy if they have the plainest food and clothing. Millions used to perish of famine, and have perished in our own time: witness the famine at Orissa in India. A very small number have more than subsistence and a mere handful are rich. This is true even of America, the most favored country on the globe. From the earth everything must come through labor; she is truly our mother, but she takes no count of our numbers. She does not become more prolific in her yields because many are to partake. She yields hardly anything voluntarily beyond a few tropical fruits.

The other fact is that in multiplying we take no count of her yield. We multiply without reference to it. Most men marry trusting to luck. A few are more provident. The first of these facts is the law of population. The second is the law of production. The law of population says, in spite of our protests, that population has a tendency to multiply in any given spot beyond the means of subsistence. We have deprived this law of its worst effects, or delayed its operation, by our improvements in the means of transportation; that is, by increased facilities for transporting people and food. But it works still, as we may see by a strike in any large city or center of industry. Thousands out of employment always apply for the vacant places, which simply means that multiplication has gone beyond subsistence at that point. Every spot in the world in which food *seems* to be abundant would speedily yield the same results. Population crowds to it, and subsistence fails. And the law of production is, that whether we apply labor to mines or to agriculture, the product does not increase in the same ratio as the labor applied. In other words, we cannot get proportionally more results by employing more men. The more men we employ, the less in proportion do the returns become. This is the solemn warning of the earth against making too great demands on her. Our intelligence is given us to heed it. To disregard it is to make the people "plebs," protected or supported by a paternal government, cared for, from their rising to their going to bed, at the expense of their more industrious and foreseeing fellows. Now, be assured of one thing: a plebs cannot carry on a free government. It supplies food for powder, or materials for a king, a Napoleon or a Cæsar, to try experiments with, but it does not supply intelligent and self-respecting voters.

RECENT PATENTS.

ACHINERY FOR WORKING STONE, &c.

No. 558,439, dated April 14, 1896. Frank Trier, of don, England. Application filed September 13,

ing cutters have hitherto been used in lressing machines either mounted on catory tool-holders or on revolving ; but both methods have disadvantages, mer being slow, the latter producing 1 instead of straight tool-marks.

his invention the spindles of the rolling are carried in links forming an endless driven by suitable gearing. This method lying the rolling cutters combines the age of the reciprocating cutter in produc- aight tool-marks with the advantages revolving chuck in having a continuous and permitting the employment of a erable number of cutters to accelerate the

re 1 of the accompanying drawings in a front view one type of a stone-work- achine in which the chain carrying the is arranged to dress horizontally. Fig. ransverse action on line *y y*, Fig. I.

rring to the figures on the drawings 1 2 3, e the links of the chain carrying the cut- 5 6, etc. The chain passes around the sprocket-wheels, 7 and 8 the teeth of engage with the links. The sprocket- are carried in the cross-girder 9, which s the slide in which the links of the cut- e guided while passing over the stone. ain is driven by means of the gearing 10 nd the pulley 13. The cross-girder can ed or lowered in the usual way on the rds 14 and 15.

stone 16 is fixed to the table 17, which ed by suitable gearing and travels at ngles to the travel of the cutters.

2 shows the cross-girder and the slide ing one of the links in section.

inventor does not limit himself to the machine shown in the drawings, but uses machines in which the cutter-chain is made to work vertical or at any required angle, or he combines two or more chains in one machine. He also arranges the cutters relatively to each other in a variety of ways according to the nature of the stone and the class of the work, and uses the cutter-chain to work moldings and curved surfaces. Sometimes the cutters are caused to touch against a suitable surface, so that friction therewith gives them a rotation before touching the stone.

STONE-WORKING MACHINERY AND RUBBING BED-PLATE THEREFOR.

Patent No. 563,081, dated June 30, 1896. David Shortsleeve, of Rutland, Vermont, assignor of one-half to John T. Webster, of Cambridge, Massachusetts. Application filed March 5, 1896.

This invention relates to machines for rubbing and diminishing stone, and has to do more particularly with rubbing bed-plates for diminishing or rubbing stone to a condition suitable for polishing; and it consists, first, of a rubbing bed-plate provided on the upper surface with a number of spaced pockets or recesses adapted for receiving, holding, and conveying water and abrasing material, such as sand, emery, chilled-iron, crushed steel, and the like beneath the stone being operated upon, said pockets having closed bottoms and terminating inside of the periphery of the rubbing bed-plate.

The invention consists, secondly, of a rubbing bed-plate provided no its upper surface with a series of radially arranged short spaced pockets or recesses adapted to receive and hold water and abrasing material, said pockets having closed bottoms, the upper ends or edges of one series of pockets terminating at points slightly beyond the commencement of the inner edge of another series of pockets or recesses.

The invention consists, thirdly, of a rub-

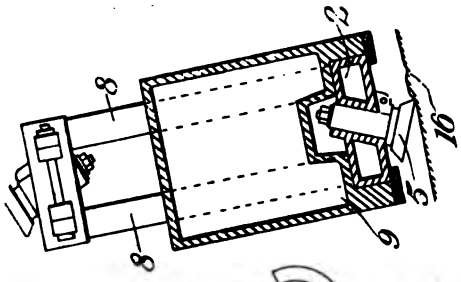


Fig. 2.

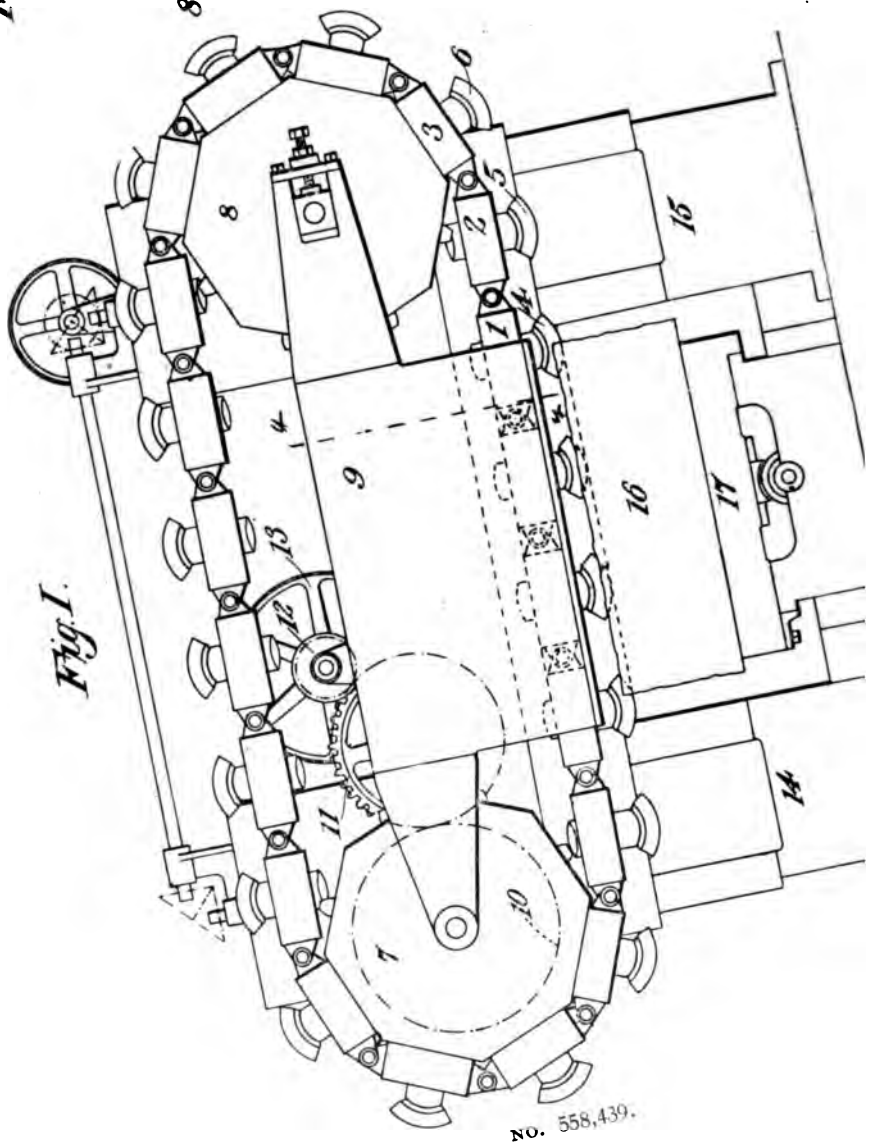


Fig. 1.

NO. 558,439.

bing bed-plate provided on its upper surface with a number of pockets or recesses adapted to receive and hold water and abrasing material, said pockets having closed bottoms and terminating inside of the periphery of the rubbing bed-plate, the pockets or recesses being comparatively deep and nearly filled with wood, lead, or other suitable solid material of less hardness than that of which the rubbing bed-plate is constructed.

It also consists of certain other novel constructions, combinations, and arrangements of parts.

In the accompanying drawings, forming part of this specification Figure 1 is a vertical section through the rubbing bed and its connections. Fig. 3 is a perspective view, partly in section, of a portion of the rubbing bed-plate showing the plate constructed in two parts.

In operating the machine the abrasing material and water are fed from a suitable source of supply H, as shown, to a point about the

Fig. 1.

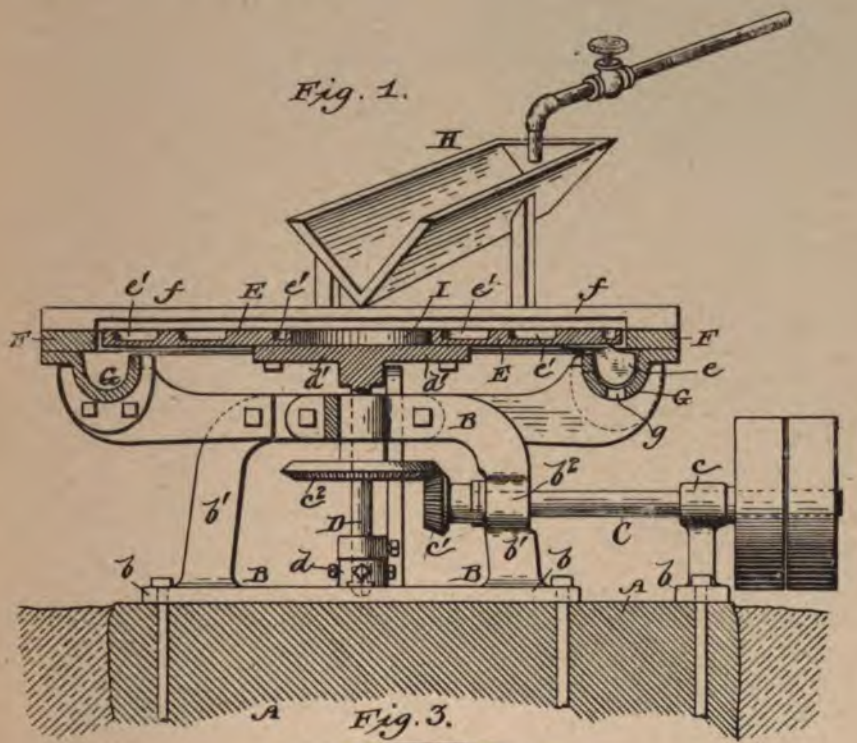
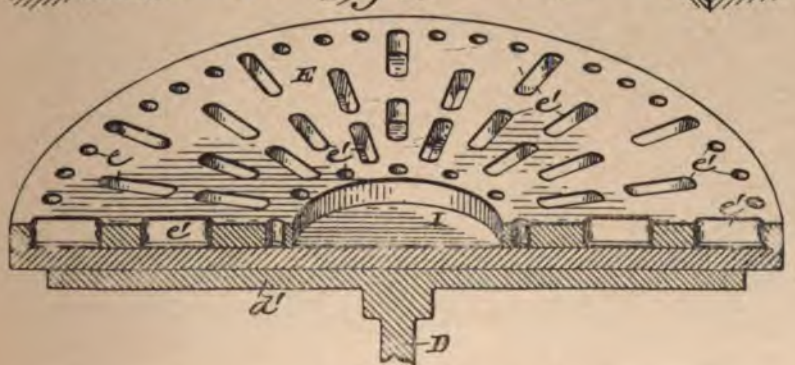


Fig. 3.



es of an outer series, and the outer ends or es of an inner series extending to or slightbeyond the inner ends or edges of an outer ies. The object and advantage of this pecur arrangement and construction are that a ontinuous broken water and abrasing feedingarface is secured over the entire surface of the ubbing bed-plate, so that the stone will be rubbed equally and evenly over its entire surface.

It will be observed that the pockets or recesses do not extend to the outer periphery of the plate.

A well or depression I may be formed in the center of the rubbing bed-plate, as shown, for receiving the water and abrasing material.

The rubbing bed-plate is described as being made in one piece or in two horizontal sections. It may be practical to construct the upper and lower plate or the entire rubbing bed-plates when a single plate is employed, in several radial sections, and suitably unite the parts.

center of the rubbing bed-plate, and a rotary movement of said plate carries the water and abrasing material by centrifugal force, first to the inner pockets and fills the same, and then to the other pockets until they are all filled. The grinding action of the stone upon the abrasing material in the pockets draws the said material out of the pockets and it is carried by centrifugal force over the outer edge or periphery of the rubbing bed-plate, and other abrasing material is fed or forced into the pockets to take the place of the displaced or worn abrasive material. This action is kept up continuously during the operation of the machine.

While it might be practical to depend upon the abrasing material to fill the pockets or recesses, to avoid any liability of the stone being chipped or broken by gravel or other substance lodging in and being held by the pockets or recesses, the inventor prefers to partly fill the pockets or recesses with a substance such as wood, lead or other suitable material, which is of less hardness than the material of which the rubbing bed-plate is constructed. The object in using a material of this character is that it will not only partially fill the pockets or recesses and leave a seat for the lodgment of the abrasing material to be fed beneath the stone, but will avoid deep depressions for catching gravel and the like, and will also wear down as the rubbing bed-plate is reduced in thickness by the wearing action of the stone.

It will be observed that the pockets or recesses are arranged radially in six series or circles, as 1, 2, 3, 4, 5, and 6, the pockets or recesses, of one series coming between the pockets or re-

MACHINERY AND SUPPLIES.

[Matter appearing under this head is compiled and edited from data furnished by the advertiser, and should not be accepted as the opinion of the publishers.]

A UNIQUE PAPER-WEIGHT.

THE accompanying cut is a *fac-simile* of a souvenir distributed by the Broderick & Bascom Rope Co., of St. Louis, Mo., at the Street Railway Convention recently held in the city of St. Louis, also distributed to the convention of Mechanical Engineers held at the Southern Hotel in St. Louis during the early part of 1896. A more useful as well as ornamental design for advertising purposes perhaps, has never been invented. It consists of a section of street railway cable, 1¼ inches in diameter, and such as is now used in the conduit of street railroads for propelling cars. It is the same kind of cable that is used on steep inclines, also in deep shaft mining. It is, therefore, practically a short sample of wire rope made to use as a paper weight, 1½ inches wide at base and three inches in height to top of handle. The base is made of metal hexagon shape so that the paper weight cannot roll off the desk, while the top is beautifully mounted with a circular metal cap with a ball handle, the entire paper-weight being plated with nickel or silver, making it a very desirable article for any desk.

There has been quite a demand on the Broderick & Bascom Co. for these since they were introduced, their original intention being to supply these only to delegates to the above mentioned conventions. They are now supplying their customers and friends and find some little trouble in keeping up the supply to meet the demand which is constantly increasing.

The Lidgerwood Manufacturing Company, New York City, the well known builders of improved hoisting engines and cableways, have recently established a branch office at 26 South Water street, Cleveland, O. This will be in charge of Robt. W. Kaltenbach, who has been connected with the Lidgerwood Company for a number of years and is well equipped to represent them in the new field and care for the wants of those needing hoisting and conveying machinery of every description.

C. L. BATCHELDER,

manufacturer's agent for marble and granite, has removed his headquarters from Toledo to Detroit, and opened capacious offices at 70 Atwater street. Mr. Batchelder is known to every dealer in Michigan with whom he has large and increasing business relations, and this move to the charming "City of the Straits" will bring him into closer touch with his steady customers. He represents a number of the largest marble and granite companies of the East.

FOR LEASE OR SALE

Meramec Highlands

QUARRIES.

ST. LOUIS CO., MO.

Apply Marcus Bernheimer, Pres.

ST. LOUIS, MO.

Quarries on St. Louis and San Fran...

15 MILES FROM ST. LOUIS.

Blue and White Lime Stone.

Fully developed, Ledges uncovered; well equipped with Two Channelers, Steam Drills, Two Saw Gauges, Gates Crusher, Derricks, Lidgerwood Cable Hoist, Plenty of Water, Quarrymen's Quarters.

Unlimited quantity of White Ashlar, Blue Steps and Sills also Blue Curbing Stone, of which St Louis requires a continuous supply.

MERAMEC HIGHLANDS CO.

SITUATIONS WANTED.

Advertisements under this heading inserted for subscribers to STONE *free of charge. Advertiser must send 25 cents to pay postage, if replies are to be addressed in care of* STONE *Rate to non-subscribers, 10 cents per line each insertion.*

SITUATION WANTED—In the cut-stone business as bookkeeper or estimator, by young man thoroughly familiar with plans and details; eight years' experience. Address E. A. DIX, care STONE.

WANTED—Position by an energetic, experienced Salesman to wholesale granite or marble in any part of the United States or Canada. Can furnish references, etc. Address "GRANITE AGENT," 327 Jefferson avenue, Oshkosh, Wis.

SITUATION WANTED—Practical Stone-cutter desires a situation as foreman, or to take charge of any job. A1 linesman; quick in figures; eighteen years experience as foreman. Address H. WATSON, 21 Royal street, Warren, Pa

WANTED.—Graduate of Massachusetts Institute of Technology (Dept of Geology) would like position as assistant to manager or superintendent of quarry, with chance to learn business or engineering parts of trade. MYRON L. FULLER, Brockton, Mass.

WANTED—Position as quarry foreman by a thoroughly competent, practical man, who understands the quarry business and all modern machinery; opening new quarries, setting up derricks, etc. Address "F. and A. M.," care STONE

WANTED—By a practical stone or marble cutter, a position as foreman or manager. Am thoroughly conversant with plans. Can run either public or monumental work. Twenty years' experience. F. L. GREENWAY, 436 Fulton street, Union Hill, N. J.

WANTED—Position as marble quarry foreman, by a thoroughly competent practical man who understands the quarry business and all modern machinery, opening new quarries, setting up derricks, etc. Address M. J. Copps Marble Hill, Ga.

HELP WANTED.

Advertisements under this heading 10 cents per line each insertion.

TO SELL. TO BUY. TO EXCHANGE.

Advertisements inserted in this department for 25 cents per line each insertion

FOR SALE—Barnhardt steam shovel. Style B. In good working repair. SERGEANT BLUFFS & SIOUX CITY BRICK CO., Sioux City, Iowa

FOR SALE.—One Ingersoll-Sergeant Bar Channeler, with bits, in good order, cheap. One new C. Aultman Co. No. 4 Stone Crusher, with elevators. One new C. Aultman Co. 20 H. P. Engine complete, cheap. Address THE PLYMOUTH STONE CO., Plymouth, O.

FOR SALE—One second-hand Ingersoll channeling ... order, for sale cheap. Apply ... Ohio

FOR SALE.—Red granite quarry. Rich, deep red stone, free from knots or veins, and is unexcelled for monumental or building purposes. Easily quarried and split. Quarry fully equipped with all modern machinery, tools, engines, steam drill, derricks, and railroad track running through entire quarry land where new openings can be made at any time into first-class stone. Address "QUARRY," care of STONE.

FOR SALE—Complete rock crushing plant and excellent limestone quarry, 100 feet of rock, no stripping; capacity 350 yards in ten hours; machinery new, facilities ample and complete; reason for selling given in interview; great bargain. Address P. O. Box No. 22, Warsaw, Ill.

FOR SALE—Cheap, a four gang marble mill and quarries, located at Loudon, Tenn. This mill must be sold or leased within the next few months, and the best offer gets the mill. Will sell or lease mill separate from quarries if so desired. Address H. N. GREER, Loudon, Tenn.

FOR SALE—State House Quarry, near Spencer, Ind., with 276 acres of the best oolitic limestone land, including the celebrated McCormick scenery and water power. Because the stone from this quarry stood the best test of all the quarries of Indiana it was selected for the state house. Here is a bonanza for the right party. Address SANATARIUM, Denkewalter Springs, Spencer, Ind.

TO LEASE.—A well known white granite quarry, located in southern part of New Hampshire on line of railroad and connected with same by branch tracks. The granite has been extensively used for buildings and monuments. It is easily quarried and split to the largest dimensions. It is free from spots and iron. Quarry equipped with derricks, steam drill and channeling machine, pumps, hoisting engine, and locomotive crane for switching and loading cars; also four houses for employes. For particulars address ROOM 83, 45 Broadway, NEW YORK CITY.

For Sale—Second-Hand Machinery,

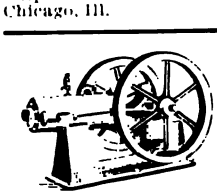
Comprising Channeling Machines, Rock Drills, Rock Crushers, Dump Cars, Hoisting Engines, Air Compressors, Steam Pumps, Pulsometers, Boilers, Etc. Condition guaranteed. Prices very low for cash. All subject to inspection before purchase.

WILLIS SHAW,
508 N. Y. Life Building, Chicago, Ill.

For Sale or Term Lease.

Bass Island Brownstone Quarry, on Bass Island Lake Superior; three miles from Bayfield, Wis.

Well equipped with Tools, Channelers, Steam Hoists, Buildings, Docks, etc. Large amount of stripping done; in all respects ready for immediate output of first-class brownstone. Quarry and stone men are invited to examine property this fall with reference to output of 1897. GEO. P. LEE, 1003 N. Y. Life Building Chicago, Ill.



Gasoline Engines....

For pumping water from quarries this is the best, most reliable and cheapest engine.

Catalogue free

The VAN DUZEN GASOLINE ENGINE CO., Cincinnati, O.

THE MANUFACTURERS' ADVERTISING BUREAU,

Located at 126 Liberty street, New York city, was established in 1879 by its present head and proprietor, Benj. R. Western, who had previously been actively identified with trade journalism in the publication of the *Engineering and Mining Journal*, the *Manufacturer and Builder* and *Coal and Iron Record*, all of New York. Mr. Western has built up a large business with the Bureau in the management of firms' advertising and newspaper work, and the frequent additions to his list of clients bears out the claims of the concern that it can handle this department of a manufacturer's business to the best advantage. The Manufacturers' Advertising Bureau deals almost wholly with the trade journals, making a specialty of this class of mediums, regarding which it is a quoted authority. A booklet with the title, "Advertising for Profit," tells how it works, and will be sent to any of our readers without cost, upon application.

THE VERD ANTIQUE MARBLE CO.,

of Holly Springs, Ga., have been engaged for some little time past in extensively altering their facilities for the production of their beautiful dark green marble. The plant has been much enlarged through the addition of new machinery. Mr. MacLachlan, who is in charge of the Chicago offices, 812–814 Title and Trust Bldg., says his company is now in position to fill orders for Verd Antique in any amount.

MESSRS. W. A. CROOK & BROS. CO.,

of Newark, N. J., have in press their 1897 catalogue. It will consist of 130 pages, liberally illustrated, and showing all the latest improvements in hoisting engines adapted for every purpose. The catalogue will cover the entire field in this class of machinery. Applications for the new work will be received now by the W. A. Croak & Bros. Co., and copies sent out as soon as possible after publication.

THE TRENTON IRON CO.,

Trenton, N. J., have recently issued a new edition of their book, "Wire Rope Transportation in All Its Branches," which is crowded with matter of interest to all who have wire rope in use. It should be a part of the library of every progressive stone man.

JOYCE, CRIDLAND & CO.,

Dayton, O.

Manufacturers of

J. C. JOYCE'S PATENT

Lever, Compound Lever, Screw and Hydraulic Jacks.

Send for catalogue illustrating our

JACKS

For Stone-Yard Use.

SPIRAL

Sand Pump

For Feeding Sand, Steel or Shot for

SAWING STONE.

Of all Kinds. Does More Sawing, Uses Less Sand and Water, Requires Less Power and Repairs than any other. Runs only 20 revolutions per minute Pays for itself in Six Months.

FRENIER & LeBLANC, Rutland, Vt.

Stone and Marble Cutters' Mallets

J. B. HELLENBERG,
Coldwater, Mich.

Our mallets are giving splendid satisfaction on all kinds of Stone and Marble. Strictly first-class second growth hickory. Write us for prices, etc.

BOOKS AND PERIODICALS.

Mrs. Mary C. Robbins in her article of Park-making as a National Art in the January *Atlantic* suggests the possibility of a system of parks from New York to San Francisco. This suggestion, while startling at first, becomes more and more possible as time goes on and the growth of park-making in our cities continues.

Some important questions of revenue policy are treated by David A. Wells in the installment of his "Principles of Taxation" that appears in *Appletons' Popular Science Monthly* for January. Among these are the use of the taxing power for purposes ulterior to providing for the expenses of the Goverument, such as supporting particular industries, enforcing morality, controlling paper currency, etc.

The January *Arena* is the most interesting number that has appeared in many months. It is of special interest to legislative bodies, physicians and lawyers on account of the article on "A Court of Medicine and Surgery," written by A. B. Choate, the prominent lawyer, at the request of leading physicians. Mr. Choate intends to inaugurate a movement which it is believed by some of the ablest lawyers and physicians will be of as vital importance to medicine and surgery as well as to the public as was the movement that resulted in the establishment of trial by jury to the public and to the legal profession. This is the opening shot of a campaign that will be waged from the *Arena's* pages by leading physicians, surgeons and jurists in the near future, and that will be carried before the legislature in Minnesota and elsewhere this winter.

We are in receipt of the edition for 1897 of "Hendricks' Architects' and Builders' Guide and Contractors' Directory of America," which contains the names and addresses of builders, contractors, manufacturers and dealers in all kinds of building supplies in the United States, and is as near a complete directory of all the constructive industries of the country that can be compiled. This work contains over 170,000 names, addresses and business classifications, comprising building and contractors of material and construction in the building and kindred industries. With full lists of the manufacturers of and dealers in everything employed in the manufacture of material and apparatus used in these industries—from the raw material to the manufactured article, and from the producer to the consumer. Price $5. The publishers of STONE will receive orders for it.

The complete novel in the January issue of Lippincott's is "Stockings Full of Money," by Mary Kyle Dallas. It is a tale of domestic relationships and affections, but turns on the mysterious disappearance of two thousand dollars, and the various suspicions as to the thief. Henry Willard French, in "A Christmas Midnight in Mexico," narrates an adventure of the road which might have ended disastrously. The other short stories are "An Anonymous Love-letter," by Virginia Woodward Cloud and "Robert the Devil," by Claud M. Girardeau. The question, "Are American Institutions of Dutch Origin?" is discussed at some length by Sydney G. Fisher, who controverts the late Douglas Campbell's contention that the Town-Meeting came from Holland. R. G. Robinson, who is an authority on the aspects and prospects of his own region, writes lucidly and instructively of "Marrying in the Fifteenth Century." "Theatre-going in St. Petersburg," is handled by Isabel F. Hapgood, who knows pretty much everything about Russia. Allan Hendricks tells of an outing "With the Whitefish Nets," and Lee J. Vance expounds the mysteries of "Walnut Lore." The poetry of the number is by Marie M. Minell, Julia Gordon, Mary E. Stickney, and Carrie Blake Morgan.

The eighth annual number of *The Tradesman*, published at Chattanooga, Tenn., contains over 200 pages, and presents the most complete, exhaustive and valuable review of the South, its resources, development and possibilities, that to our knowledge has ever been published. The information given is the result of careful investigation and practical knowledge. The business directories and sta-

tistics are most valuable features of this valuable number and it will be preserved as a reference book on all subjects pertaining to the South and its resources.

THE CALENDAR CROP.

James Macbeth & Co., 128 Maiden Lane, New York, manufacturers of electric blasting specialties, who are as well known to readers of STONE as its publishers, having been continuous advertisers since the magazine was founded, have sent out a very neat hanger, showing reproduction in half-tone of a noted picture, and marginal illustrations of their instruments. It is notable for its neatness and conspicuity.

The Leschen-Macomber-Whyte Co., 10 to 21 South Canal street, Chicago, dealers in quarry specialties, such as wire rope, tackle blocks, cordage, etc., issue a very neat calendar in half-tone and colors. It is chaste and elegant in design and finish.

The Battle Creek Steam Pump Co., Battle Creek, Mich., who produce one of the very best steam pumps in existence, are favoring their friends and those whom they desire to enroll as new acquaintances, a rich production in the calendar line in the shape of a steel engraving on heavy cardboard. It is a costly, handsome, clean and artistic specimen.

Next comes Legner & Quaing, designers and dealers in art monuments, statuary, chapels and mausoleums, Cincinnati, and enriches our collection with a poetic production in black and gold. The subject is Perrey's "Phœbe," and whoever gazes upon her incomparable loveliness, as she sails through the starlit empyrean clad only in the gauzy mantle of her matchless beauty, must owe a thousand thanks to the enterprising firm that has put this fascinating picture before them.

Pope Mfg. Co., Hartford, Conn., who have a patent on the precedent as calendar publishers, as well as on the peculiar style of the specimen it issues, sent out their twelfth annual contribution of the Columbia. It is encased in a neat metal stand, and includes a memorandum block with a leaf for each day. It can be had for five two-cent stamps.

THE CONCORD
(Jenny Lind)
Polishing Machine.

MANUFACTURED ONLY BY THE
CONCORD AXLE CO.,
PENACOOK, N. H.

Send for Circular and Price-List.

HOISTING, MINING, BRIDGE ERECTING,

Dock Building, Pile Driving, Coal Hoisting and Quarry Engines

of any power, Sugar Cane transferring engines, transferring machines for depositing cane from car to carrier, with my improved Patent Friction Drums with or without Boilers. Any amount of reference given. Established 1870. ☞ Send for Catalogue.

J. S. MUNDY, Newark, N.J. 1744 Market St., Philadelphia, Pa., 22 Light-st. Baltimore, Md., 117 Water-st., Pittsburgh, Pa., 349 S. Jefferson-st., Chicago, Ill., 715 N. Second-st., St Louis Mo., 34 Fremont St., San Francisco, Cal. 85 Front-st., Portand, Ore., 4th and Wakouta-sts., St. Paul, Minn., 218 Congress-st., Boston, Mass.

Subscribers

Will do us a favor by sending postal card notice when the magazine fails to reach them. The newspaper mails are heavily burdened and consequently slighted by over-worked post-office clerks, and often go astray. We will always send duplicate copies.

DO YOU USE POWER? All right; you need CHEAP Power. One Cent per Horse Power per Hour is CHEAP. Weber Gasoline Engines *run anything.* *"Economy in Power" is our motto. For Catalogue and testimonials address*

WEBER GAS & GASOLINE ENGINE CO.,
403 S. W. Boul., Kansas City, Mo.

Steger Pianos

CELEBRATED FOR THEIR
Liquid Quality of Tone
Elasticity of Action
Great Durability

STEGER & CO.
MANUFACTURERS
COR. WABASH AVE. AND JACKSON ST'S CHICAGO, ILL. U.S.A.

50 YEARS' EXPERIENCE.

PATENTS

TRADE MARKS, DESIGNS, COPYRIGHTS &c.

Anyone sending a sketch and description may quickly ascertain, free, whether an invention is probably patentable. Communications strictly confidential. Oldest agency for securing patents in America. We have a Washington office. Patents taken through Munn & Co. receive special notice in the

SCIENTIFIC AMERICAN,

beautifully illustrated, largest circulation of any scientific journal, weekly, terms $3.00 a year; $1.50 six months. Specimen copies and HAND BOOK ON PATENTS sent free. Address

MUNN & CO.,
361 Broadway, New York.

WILLIAMSPORT WIRE ROPE CO.
MANUFACTURERS OF
Iron, Steel and Galvanized
WIRE ROPE
HOISTING AND HAULAGE ROPES
A SPECIALTY.
WILLIAMSPORT, PA.
Correspondence Solicited.

AGENTS WANTED For the most valuable contribution to the literature of the world since the production of the Bible. The Great Work of the Great Thinkers, Famous Orators, Renowned Scholars, Wise Writers and **INVESTIGATORS** of the 19th Century.

In all the range of literature there is not another book like

THE PEOPLE'S BIBLE HISTORY

In this book alone can be found the information sought by every Bible reader, whether old or young, scholarly or unlettered. It is, indeed, a great work.

Recent discoveries in archæology have brought the world of today face to face with the men who lived, and acted, and wrote during the early periods covered by Biblical Historians. These discoveries have resulted in the triumphant vindication of the sacred volume from the charges brought against it by open foes and pretended friends. Every intelligent person will order the book, as the matter contained in it is of vital importance and cannot be found in any other book on earth.

Write for descriptive and beautifully illustrated pamphlet circular. Address

THE HENRY O. SHEPARD CO.
212-214 Monroe St. CHICAGO.

NOTES FROM QUARRY AND SHOP.

Work at the Bluehill, Me., granite quarry is very lively. The company has work enough to last them until August, 1897. At the present time one hundred men are employed cutting stone for the St. John Cathedral which is being built in New York. The company are increasing their plant, having put in four new hoisting engines. The value of the entire plant is about $20,000.

The business of quarrying in Colorado during 1896 shows a total production of $1,305,000, divided into marble, $80,000; sandstone, $250,000; limestone, $300,000; granite, $25,000; lava and others, $50,000. Active quarries are found in Gunnison, Pueblo, Chaffee, Boulder, Garfield, Larimer, Clear Creek, Jefferson, Fremont and La Plata counties. Year by year the demand for Colorado building stone increases and it is becoming an important factor in the business interests of the state.

The Marble and Granite Dealers' Association of Iowa will hold its third annual convention at the Kirkwood Hotel, Des Moines, on the 20th inst. The program for the meet is as follows: Banquet, Jan. 20, 9:00 p. m.; 1. Address of Welcome—Chas. O'Donnell.; 2. Impromptu speeches from each member present on the following subjects: 1. Our Accomplishments. 2. Our requirements. 3. Our Integrity.

Mt. Olivet, O.—About 1,500 people were present at the cemetery expecting to see the body of Charles Bramel buried in a stone coffin, and whisky poured over the body, as he had requested. The crowd was disappointed. Mr. Bramel's body was buried in a beautiful rosewood casket. He had grown so corpulent since the stone coffin was made that it was found to be too small to contain his body. The barrel of whisky he planned to have poured over his body will probably go inside the living bodies of some of his relatives. He left a fortune to his widow and four children.

Lockport is the center of an important quarry industry and the local quarrymen and other business men fail to understand why the Government should think of going to Canada for stone for the new Buffalo breakwater when there are a dozen places in western New York along the line of the canal, that could supply the demand a dozen times over, says the Buffalo *Express*. One of the leading quarrymen of Lockport discussed the subject freely. He said: "I have talked with quite a number of quarrymen here and all through western New York relative to the proposed plan of the United States Government for bringing stone for the new Buffalo breakwater from Canada. Without exception, I have found that great indignation prevails. I would infer from what I have read that it was assumed the stone for the great work could not be procured on this side, when, in fact, the amount of stone could be quarried from thirty-one acres, providing the ledge of rock was ten feet thick. In the city and town of Lockport there are hundreds of acres of quarry land containing stone exactly adapted for the requirements of breakwater building. The majority of the quarries here are on the canal, making the facilities for shipment the best imaginable, as the stone could be loaded on canal boats and shipped direct to the breakwater. There are between here and Rochester, along the line of the canal, about one hundred quarries. Stone in the quarries is worth very little, the fact being that the very large percentage of the money paid out for stone goes to the quarrymen. All with whom I have talked on this subject agree with me that it seems wrong and unjust to the American workingmen that this money should be spent in Canada when it could be used to better advantage in this country. It is a fact that heretofore all the stone used in the Buffalo breakwaters have been taken from the western part of this state. The stone thus obtained and the cheapness of transportation were in every instance entirely satisfactory to all concerned. The furnishing of one kind of stone for this breakwater will mean the expenditure of about $1,250,000."

The Sibley Quarry Company have made great improvements at their quarries, between Trenton and Wyandotte, Mich., the most important of which is the $25,000 cable haulage or elevated carrier for transporting stone from the quarry to the crusher, railroads and docks.

Air Compressors

and

neumatic Tools in the Stone-Worker's Shop Produce This Result:

VIEW OF INGERSOLL-SERGEANT COMPRESSOR RUNNING GARVING TOOLS.

USED IN QUARRIES BY

Allegheny Quarries,
LANCASTER, OHIO
Corydon Stone Co.,
CORYDON, INDIANA.

STONE WORKERS

L. L. Manning & Son, PLAINFIELD, N. J.
Bowker, Torrey & Co., BOSTON, MASS.
J. S. Rowe, BEDFORD, IND.
Many Others.

COMPLETE PLANTS FURNISHED.

The INGERSOLL-SERGEANT DRILL CO.

D COLONY BUILDING,
CHICAGO.

HAVEMEYER BUILDING,
NEW YORK.

201 CONGRESS STREET,
BOSTON, MASS.

26 SOUTH WATER STREET,
CLEVELAND, O.

ROCK DRILLS. CHANNELERS FOR QUARRYING.

The carrying capacity is one ton a minute. The iron work was done by the Trenton Iron Works, of Trenton, N. J. The system is what is known as the Bleicher system. A bridge for the protection of trains in case of buckets falling or other accidents has been built over the tracks of both the Lake Shore and Michigan Central railroads. It is one span, 275 feet long, 20 feet wide, and 35 feet in the clear. It is anchored by six anchors made of 100 tons of stone, and 100 barrels of cement in each. The power house, machine and blacksmith shops are finished. A 6-inch water main has been laid from the power house to the river for supplying the boilers with water. When the improvements are completed the Sibley Quarry Company will have one of the best equipped lime, crushed and building stone quarries in the country. The company now employ 150 men and expect to increase that number next spring.

The stone producers of northern Ohio held a meeting Dec. 1 in the office of the Forest City Stone Company, at Cleveland, O. To a reporter who was in the office as the quarry proprietors were leaving, Mr. Stewart, the president of the Forest City Company, said that the gathering was merely a regular meeting of the Quarry Owners' Association, and the business under consideration was simply the adjustment of prices. The organization, he said, came into existence last January or February. It was considered best by the proprietors, he said, for them to look each other squarely in the face in matters of common business, and agree upon a uniform plan of deportment toward customers in order that the latter might not demoralize all business by using the offers of one company as a lever upon the others. He was asked what stood in the way of a coalition of the several interests as one big company. To this he replied that there was great difficulty in arriving at an agreement as to property values, and then when a man's business had passed into the hands of a company, no revenue remained to come from it but dividends. There would be no assured salary, he said, and a young man did not care to be retired from his own business. He added that any statements to the effect that the stone men were to form into a closer combination, or a company, were premature. Some injury, he believed, had come to the stone men because of the appearance of the statement, both through an effect upon collections, and by causing restlessness upon the part of workingmen. All the stone producing companies, including the Cleveland Stone Company, he said, were represented at the meeting. Asked as to what had been said about the accounts of a closer combination in process of organization, he replied that the proprietors had joked with each other some about the matter, and tried to learn who gave the information to a *Leader* reporter, but without success. Mr. Stewart remarked that there had been promoters about, in the past, as well as recently, endeavoring to obtain options on quarry property for the purpose of amalgamating interests, but he said no option had been given by the Forest City Stone Company. Five years ago, he remarked, there was a stone pool, but it failed because some producers persisted in remaining outside."

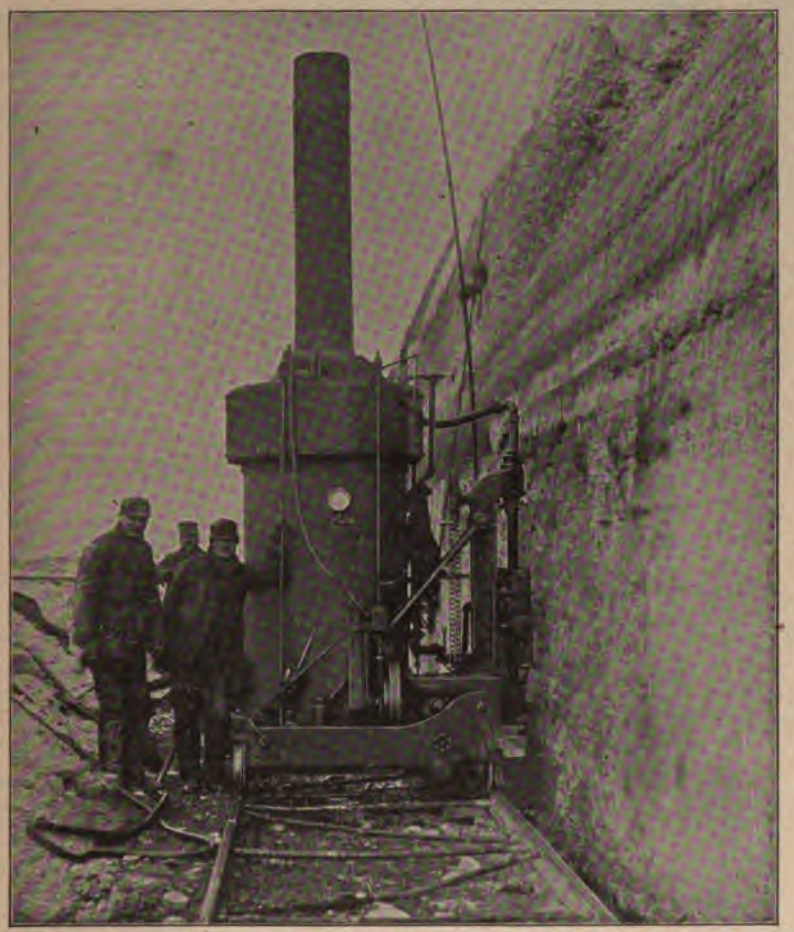
George W. Meyer, of Minneapolis, Minn., General President of the Journeymen Stone-Cutters' Union, having been admitted to the bar in that state, has resigned his official position, and severed his connection with the Brotherhood.

David J. Kelly, president of the Denver Onyx and Marble Manufacturing company, has been in Washington, D. C., to see the supervising architect of the United States treasury and endeavor to have inserted in the specifications for the erection of the Denver mint, that the building be constructed of Colorado marble and white marble. The Pueblo public building will be constructed of stone imported from Indiana and it is feared that unless something is done the mint will be erected in the same manner, to the benefit of Vermont quarrymen.

"Why," says Mr. Kelly, "it is time for Colorado people to stir up. The Denver mint should be made the most handsome building in the west. I would suggest that it be constructed from foundation to dome of pure white marble, and Colorada marble at that. Colorado has the finest marble in the world, some of it equal to the famous Numidian marble of ancient days, but we have got to have a chance to develope our quarries. Take the Pueblo public building for instance. Why, Colorado marble men were not allowed to bid at all on that because they would not bring their prices down to the level of Eastern marble. We have white marble in Colorado which is beyond experiment. It is a finer, whiter, finer-grained

SULLIVAN

Channelers and Gadders!



THE SULLIVAN CARRIAGE CHANNELER USED ON DRAINAGE CANAL

55	Sullivan Channelers	in use	on	Chicago Drainage Canal.
80	"	"	"	in Vermont Marble Quarries.
27	"	"	"	in Southern Marble Quarries.
20	"	"	"	in Sandstone and Limestone Quarries.
15	"	"	"	in New York Marble Quarries.

CK DRILLS of all sizes and for all purposes. DIAMOND CORE DRILLS for testing mineral or quarry lands

Sullivan Machinery Co.,

in Office. 54 to 60 N. Clinton St., CHICAGO. Eastern Office & Works, CLAREMONT, N. H.

marble than is found in the East. You can look the world over and you won't be able to find more handsome marble than is being placed in Colorado's capitol."

For some time water in great quantities has accumulated in the Moellering stone quarry, two and one-half miles west of Wabash, Ind., greatly interfering with the work, and George Jenks, who is operating the quarry, determined on trying to get rid of the water by sinking a well in the quarry, in the hopes that the water might soak away, thus avoiding the expense of draining it. He commenced drilling, and after reaching a depth of twenty-two feet, he, to all intents and purposes, knocked the bottom out of the earth. At any rate he broke through a bed of rock into which he was drilling into some kind of a subterranean passage and the water all disappeared with a rush, and he has not been bothered in that way since. Thus far he has not been able to find the bottom of his well.

The quarry business at Sand Prairie, twelve miles north of Berlin, Wis., booms both in winter and in summer, for the stone in that section can be worked in the coldest of weather, while that at the Berlin quarry cannot be worked to advantage after being penetrated by the frost. When the Berlin quarry shuts down, workmen who have families or wish to remain in the section and find employment, form themselves into co-operative companies, purchase a quantity of stone from one of the companies who own quarries at Sand Prairie, turn out paving blocks, and divide the profits from the sale thereof among the members of the company. Thus the paving cutter, if he so desires, can find work throughout the winter, and at the same time give employment to farmers who haul the stone for shipment by rail. There are three such companies at work in one quarry, one comprising seventeen men, thirteen in the second and three in the third. There are also gangs at work at several other quarries.

A review of the stone business of Chicago for 1896, shows that in building the amount used decreased compared with 1895, from 25 to 30 per cent. Prices declined about 10 per cent, and taken altogether the business was far from satisfactory or profitable. About one-third of the men usually employed in the yards of the city were laid off, but the wages of those working were not lessened. Within the last few years there has come a great change in the use of stone for foundation purposes, dimension stone being almost entirely superseded by crushed concrete or rubble stone.

The rock quarries near Rockland, Texas, will resume operations as early as possible. Messrs. Charles Clarke & Co., of Galveston, having secured the contract to furnish rock for Sabine Pass. They expect to begin shipping in ten days.

Chrisman, Ill., would be happy if it had a tombstone factory. What it really wants is a rock pile, says an envious newspaper.

Directors of the Western Stone Company, Chicago, Ill., have lopped one per cent. off the three per cent. dividend declared recently, owing to the fact that some of the assets of the company were tied up in the defunct National Bank of Illinois. There is required for dividend purposes, figured on the basis of three per cent., $67,500. Cutting the dividend rate to two per cent., only $45,000 will be required, thus effecting a saving of $22,500 in the amount to be sent to stockholders. In the notice of the reduction of the dividends nothing was said about declaring a supplemental dividend of one per cent. as soon as the National Bank of Illinois had paid to its depositors the amount of their claims or any part thereof.

Mr. Joseph Brunet, of the Laurentian Granite Company at St. Phillippe, Argenteuil, Canada, points out that they produced a large quantity of granite from a light red to a deep pink in color, and their quarries were large enough to supply the whole of Canada. At present the duties were 20 per cent. on rough and 30 per cent. on finished material.

The Babcock quarries at Kasota, Minn., are unusually active for this season of the year and a crew of 100 men are now constantly employed in getting out rip rap for the Omaha road at Mankato.

Blair & Larsen have purchased a double cylinder, double drum hoisting engine, with boiler, and are placing same in their quarry at Lannon, Wis.

THE WARDWELL
Steam Stone Channeling AND Quarrying Machine

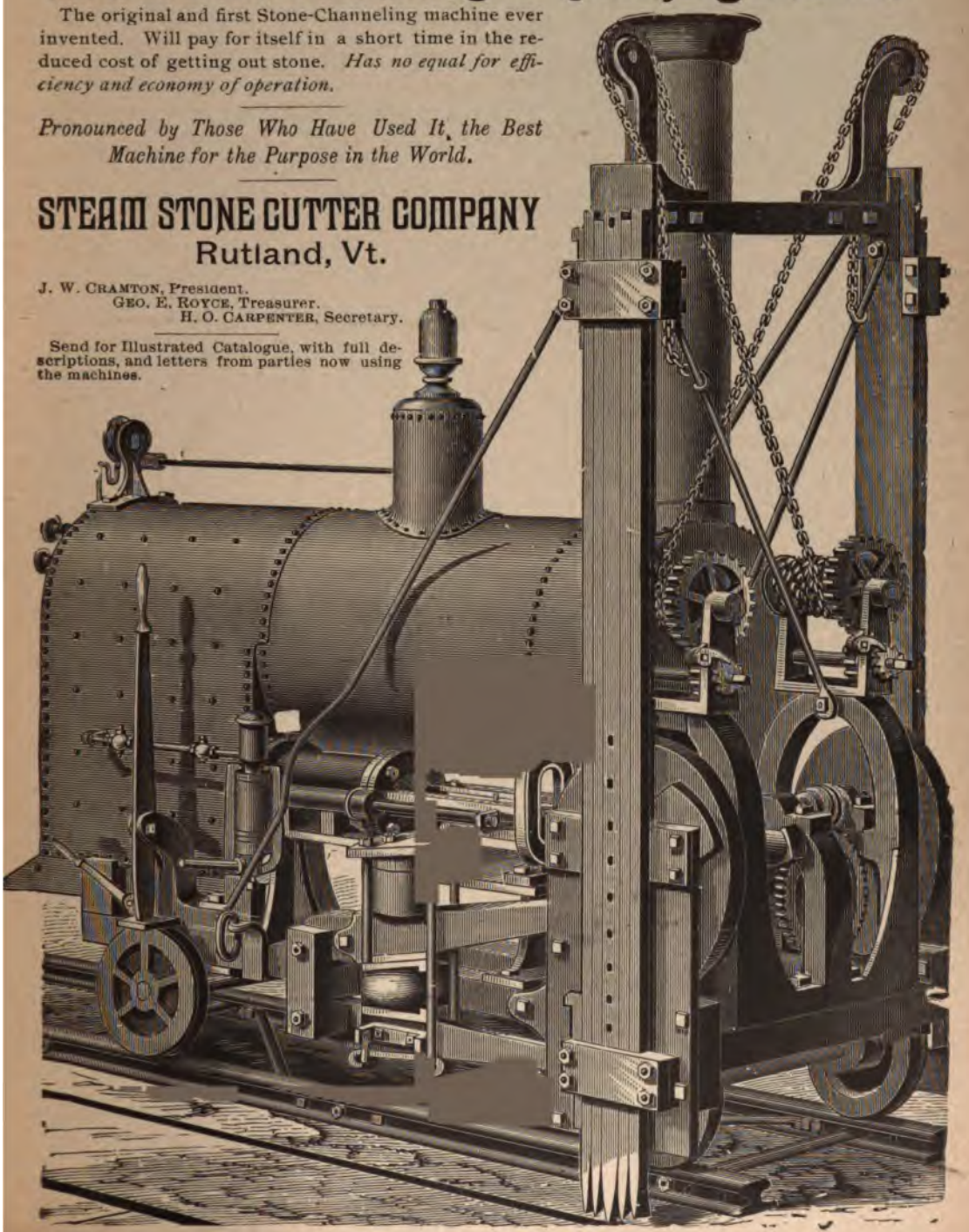
The original and first Stone-Channeling machine ever invented. Will pay for itself in a short time in the reduced cost of getting out stone. *Has no equal for efficiency and economy of operation.*

Pronounced by Those Who Have Used It, the Best Machine for the Purpose in the World.

STEAM STONE CUTTER COMPANY
Rutland, Vt.

J. W. CRAMTON, President.
GEO. E. ROYCE, Treasurer.
H. O. CARPENTER, Secretary.

Send for Illustrated Catalogue, with full descriptions, and letters from parties now using the machines.



Williamsport, Ind.—A big stock company, composed of capitalists of Chicago and this city, are opening out a fine stone quarry on the Vermilion river, about fourteen miles from Danville, Ill.

Jersey City. N. J.—Hugh Young, of Flagtown, Somerset county, died Tuesday, Dec. 22. He was for a time engaged in the marble business in New York.

Pittsburgh, Pa.—James Harrison, aged 73 years, died at his home in this city, Dec. 20. Mr. Harrison at one time was one of the best known stone contractors in this city.

Medina, N. Y.—John Ryan, aged 96 years, died at his home in this place Sunday, Dec. 20. Mr. Ryan discovered and developed the quarries of Medina sandstone.

Bluehill, Me.—The White Granite Company have discharged their cutters and will probably close down for the winter.

Middletown, Pa.—There are about 150 men working at the Waltonville quarries at present, a number of men being added to the force last week. The outlook for the winter is good.

New Britain, Conn.—J. H. Cook has closed his quarry at White Oak. The forty men employed there have all been discharged.

At a meeting of the stonemasons of Kansas City, Mo., it was resolved to bring the following notice before the public, and especially parties interested in building: "On the first of this year (1896) it was agreed between the stone contractors and stone masons to work eight hours per day, and at a rate of wages specified and agreed to by both parties. There has been a few contractors who have been taking work and working their employes ten hours per day, and paying their employes all rates of wages. Parties who have given their work to those contractors have been remonstrated with, but have pleaded ignorance, and could take no action after the contract was let. We would respectfully ask the public to patronize those contractors who have stood by their agreement, as action is likely to be taken that may be inconvenient to both parties."

Calais, Me.—The strike is still on at the Maine & New Brunswick Red Granite Works, no settlement having yet been made, and judging from the determination displayed by the stone-cutters to refuse to accept the present scale of wages, it looks as though the company will experience some little difficulty in coming to satisfactory terms. There is considerable stock ahead as well as several very important orders, and work will soon have to commence in order to keep up with the orders now secured

Ryegate, Vt.—At present the granite busines seems to be at a very low ebb, but it appear that after New Year's business will begin agai

Minneapolis, Minn.—The joint meeting the contractors and the stone masons at Lab Temple Dec. 14 was a success and both parti entered into it with an idea to treat each oth fairly. The meeting was called for the purpo of fixing the wage scale. The stone maso had asked for a uniform rate of 30 cents hour, and the contractors present agreed to the new rate and expressed themselves in favor of a nine-hour day. A committee was appointed to see the contractors who were not present. The new scale will go into effect April 1, 1897.

Directors of the Western Stone Company at their meeting Dec. 15 declared a dividend of 3 per cent. upon the capital stock. The dividend is to be paid out of the surplus and the earnings for the year, which are said to be good, but which have not yet been made public. The surplus with which the Western Stone Company began the year 1896 amounted to about $27,000), and to this there is to be added this year's earnings. During the year 1895 the Western Stone Company earned $92,000, or between 4 and 4½ per cent. upon the capital stock. The surplus carried over from the preceding year was in round numbers $10,000, which, with other receipts, gave the company enough of a surplus to pay the 3 per cent. upon the capital and have $27,000 left. The dividend declared is payable on Jan. 11 to stockholders of record Dec. 24. The capital stock of the Western Stone Company is $2,250,000, and there is required for dividend purposes $67,500. The action of the directors shows that if the dividend is to be paid out of surplus and earnings the earnings for the year have been in excess of $40,000, as that is the amount required in addition to the surplus at the beginning of the year to pay 3 per cent. It is probably considerably in excess of this amount. A director

NEW ENGLAND AGENTS:
Woodrough, Mansfield & Co.,
220 Franklin St., Boston, Mass.

PITTSBURG CRUSHED STEEL COMPANY

LIMITED.

717 GRANT STREET, PITTSBURG, PA.

PATENTEES & SOLE MANUFACTURERS OF

Crushed Steel, Steel Emery,

DIAMOND

Putty Powder and Rouge.

TRADE S MARK

THE BEST ABRASIVES KNOWN FOR

Rapid Polishing, Rubbing, Grinding and Sawing of Granite, Marble, Stone, Onyx, Brick, Glass, Metal, Etc., Etc.

EASTERN OFFICE:
BILLINGS & JOEL,
124 W. 23d St., New York.

B. C. & R. A. TILGHMAN,

1118 to 1126 South 11th-st. - - - PHILADELPHIA, PA.

Patent Chilled-Iron Globules, or

SHOT

For Fast Sawing and Rubbing of Stone.

Original and Standard Material of this Kind. Warranted Superior to all Imitations and Substitutes Costs Less, Cuts Faster and Wears Longer than Anything Else. A Competitive Trial with Anything in Cutting Stone Solicited.

SPEED, DURABILITY, ECONOMY, SAVING OF SAW BLADES, REDUCTION OF POWER. OVER TEN YEARS' CONSTANT USE.

Send for circular. See new prices for 1894.

said recently the year had been as profitable as last year, and the prospects for the coming year are said to be good. The stock of the Western Stone Company at this time last year was the most active on the list. Sales ran up to several hundred shares in a day, and the price advanced to the highest point in the year during the month of December. The fact that a dividend was to be declared seemed to have become known to some of the brokers, resulting in the advance and in the activity shown.

Brooklyn, N. Y.—A recent circular issued by the Journeymen Stone Cutters' Union of New York and vicinity makes it improper for a fitter to hoist stone or do any work which will interfere with the interests of derrickmen, and subjects the offending fitter to a fine of $5 for the first and $10 for the second offense.

Muskegon, Mich.—Fire a few days ago at the Montague Iron Works, at Montague, did considerable damage. The boiler was ruined and there was other damage in the engine room. Total loss several hundred dollars. It will be replaced at once.

Altona, Man.—The Altona Milling Company's roller flour mill, which was just completed, was burned to the ground Dec. 8. The work of rebuilding will be commenced at once, and new machinery put in.

New Brunswick, N. J.—The Masonic Hall in this city, the largest building here, was destroyed by fire Dec. 21. The edifice cost $300,000, was five stories high, and was filled with occupied offices. The loss is about $400,000. It will probably be rebuilt at once.

Hot Springs, S. D.—It is stated that the lithograph mine, of which much has been said during the past year or more, has been proven by repeated tests to be the genuine article, and of a very high quality. The *Journal* says: "Something over two years ago W. R. Bond discovered what he believed to be lithograph stone near Pringle station, in this county. He said but little at the time, but spent a year prospecting to find a sufficient body to warrant a continuation of the development. This point settled, he put in another year and spent considerable money in testing the quality of the stone, interesting capital in the enterprise and perfecting the organization of the company. The stone has been thoroughly tested and its quality found equal to the best Bavarian product. Through Mr. Bond's efforts a company has been formed and duly incorporated, stock subscribed and enough paid up to insure the active working of the mine. The winter months will be devoted to getting in shape for active operation in the spring. In the early spring a complete plant for turning out the finished product for the market will be put in."

Among the Omaha gentlemen interested in the enterprise are Frank Carpenter, of the Carpenter Paper Co.; M. H. Redfield, county clerk of Douglas county, and E. W. Bartlett of Klopp, Bartlett & Co., lithographers.

Washington, Vt.—S. Slack has opened a new marble quarry on the farm of M. W. Chamberlin, of this place, which promises well.

Troy, N. Y.—Roger McCormick, former foreman of the Nixon Red Slate Company, of Granville, has opened a sea green quarry on the farm owned by Patrick Roach, in South Poultney, Vt. The first blast produced blocks from which a fine quality of slate was made. It is expected that New York capitalists will develop this vein.

Huntington, Ind.—Lon Easty and T. L. Lucas & Son have opened a stone quarry on their land south of the Wabash river, near the Richmond quarry.

St, Albans, Vt.—J. G. Moore is getting ready to open a marble and granite shop in the Barnes building on Lake street in this city.

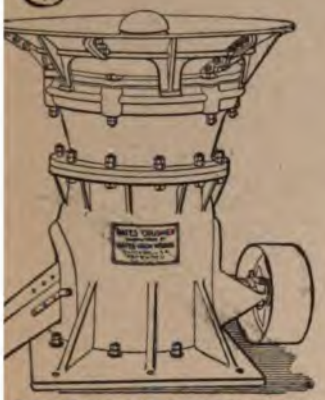
East Barre, Vt.—William Cotton has leased from Pittsley Brothers the sheds formerly used by A. J. Young, and will operate a stone business.

Kingston, Mo.—The Caldwell county court house, a very fine brick structure, which was recently destroyed by fire, causing a loss of $30,000, is to be rebuilt at once.

Philadelphia, Pa.—David B. Lewis, a member of the Union League, died Dec. 18 at his home in Chester Springs, Chester county, of typhoid fever. He recently owned and operated a stone quarry in Chester county.

Racine, Wis.—H. H. Edwards, a resident of Racine for forty years, died Dec. 20, aged seventy-two years. He established the three largest stone quarries in Racine.

GATES ROCK AND ORE BREAKER



1896 MODEL BETTER AND CHEAPER THAN EVER.

Sale of 1895 far exceeding any other year.

Agents for

Hadfield's Manganese and Chrome Steel,

Manfd. by TAYLOR IRON AND STEEL CO.

Unequaled for wearing parts for Rock Breakers, Stamp Mills, Etc.

Designs for Complete Crushing Plants.
Send for Catalogue.

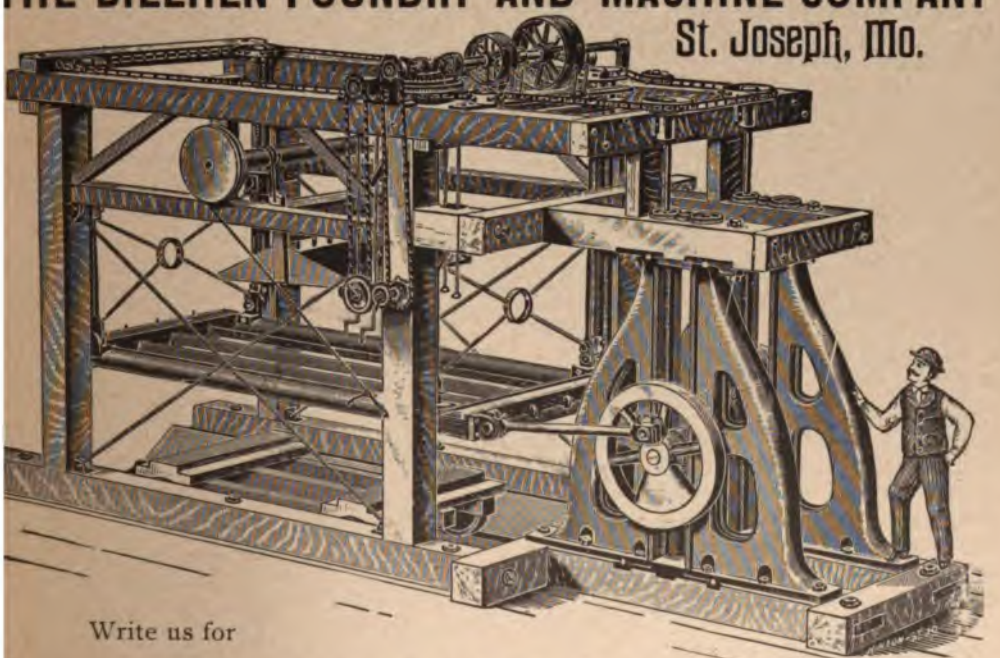
BRANCH OFFICES:
36 *Liberty St., N. Y.*
Butte, Mont.
1 *Calle de Gante, City Mexico.*
3a *Queen Victoria St., London, Eng.*

GENERAL MINING MACHINERY

GATES IRON WORKS, Dept. T. 650 ELSTON AVE., **Chicago.**

THE BIELHEN FOUNDRY AND MACHINE COMPANY

St. Joseph, Mo.



Write us for

Stone Saw-Mill Machinery

Port Chester, N. Y.—Samuel Bailie, for many years a resident of this place, died at his home Wednesday Dec. 9. He was, for a long time, engaged in the marble business.

A fire in the granite polishing shop of George H. Hitchcock, on Quarry street, Quincy, Mass., Dec. 5, destroyed all the machinery. The loss on the buildings, stones and machinery is estimated at $10,000.

Geo. E. Hall, who twenty years ago was one of the most prominent business men of Cleveland, died Dec. 4 at Detroit. At the time of his death Mr. Hall was sixty-five years old. The deceased invested considerable money in the marble business, some years ago, at Rutland, Vt. During the past ten years, however, he has been engaged in the business in a small way, having maintained an office in New York City a part of the time.

Perryville, N. Y.—Frederick W. Hodge, the proprietor of the Perryville Quarry Company, was blown to pieces Dec. 4 by an explosion of dynamite and nitro-gelatin in the storehouse of the company. It is said the explosion was due to carelessness.

Providence, R. I.—Notice has been posted at the works of the Smith Granite Company, at Quarry Hill, Westerly, of a reduction in wages of a portion of the help to an amount not to exceed 10 per cent. Fifty men, including paving cutters, drillers and some of the regular cutters, have been laid off for an indefinite period.

Middletown, Conn.—The New England Quarry Company will not be sold to the Consolidated Quarry Company as has been reported.

Middletown N. Y.—The Mount Eve quarries of the Empire State Granite Co., which were closed during the summer, resumed operations on an extensive scale, Monday, Nov. 23. The company has put up five derricks, two hoisting machines, steam drills, and other implements for rapid work.

Mankato, Minn.—The mill used for sawing stone into sidewalk flagging at W. B. Craig's stone quarry, was burned Nov. 27, entailing a loss of $5,000. The stone sawing mill is owned by W. B. Craig. The entire plant, consisting of stone quarry and machinery, is leased by the Mankato Stone and Lime Company. The building was not insured, and the loss is almost entirely on the machinery, which is a total loss.

The People Stone Company, of Sheffield, Jackson County, Missouri, filed a statement Nov. 30 of increase of capital stock from $6,000 to $15,000.

Mansfield, O.—The Lucas Stone Co. is now making arrangements to do an immense business in a very short time. The promised revival of business has not yet reached the company, and in fact matters in that line of business are as tight as they have been for some time, yet the company is determined to have the lion's share of the stone business in Ohio. Receiver Charles Brumfield, of the Bank of Mansfield, is making arrangements to put in a line of improved machinery that will increase the capacity of the quarries. A number of large orders are on hand to be filled.

Columbus, O.—The Fish Stone Company has closed down their stone sawmills for this season. The stone-cutters will work part time all winter.

Concord, Tenn.—The marble quarries here have shut down and the men have gone elsewhere for work.

Huntington, Ind.—Articles of association have been filed in the county recorder's office by Beck & Purviance, a company organized for the purpose of leasing or otherwise acquiring land near the city of Huntington for getting limestone, cement rock, building stone, etc. The capital stock of the company is $30,000 and shares are sold at $100 each. The time of the existence of the company is fixed at fifty years. Directors are elected annually, and for the first year they are Adam Beck, Hamilton M. Purviance and Adam L. Beck.

Boston, Mass.—In the United States Circuit Court a verdict of $2,000 for the plaintiff was returned, Dec. 3, in the case of Henry Hendrickson, a Finn, vs. the Cape Ann Granite Company, an action brought to recover $6,000 damages for personal injuries, a compound fracture of the leg, sustained by plaintiff, Dec. 9, 1895, by being struck by a derrick while in the employ of the defendant.

Jonestown, Pa.—John A. Wenger, marble, reported to have given judgments for $820.

Des Moines, Ia.—International Marble & Granite Works, E. Kranz, reported to have given bill of sale one interest to H. Cohrt.

Toledo, O.—Frochlich & Stoliberg, monuments, reported to have given real estate mortgage for $600.

San Francisco, Cal.—Leon R. Meyers, marble, reported to have given judgment for $543.

Louisville, Ky.—Louisville Paving Company reported to have made an assignment.

Omaha, Neb.—Drexel Stone Company, reported to have given judgment for $126.

Richmond, Ky.—George O. Dozier, proprietor of the Madison County Marble Works, assigned to Squire D. P. Armer. Assets and liabilities unknown.

Baltimore, Md.—The case of Charles R. McConkey against the Peach Bottom Slate Company of Hartford county to recover $5,000 for alleged services as agent in making sale of certain property has gone to the Circuit court.

Ironwood, Mich.—It is reported that the Ashland Brownstone Company has secured the contract for all the stone that will go into the new public building at Saginaw—27,000 cubic feet.

Middletown, N. Y.—The Empire State Granite Company, of Goshen, has been awarded a contract to furnish a large quantity of stone for the New York City Dock department. The amount is sufficient to give employment to from fifty to seventy-five men for the next six months.

Jacksonville, Fla.—Colonel Benyard, in charge of the United States engineering works in this district, opened bids in his office Dec. 17 for the supplying of stone for the construction of the St. John's river jetty work. The contract was awarded to Captain R. G. Ross, whose bid was $150,000. There were eight bids in all. The contract will be submitted to the War Department at Washington for ratification.

Keokuk, Iowa.—The F. W. Menke Company, of Quincy, has been awarded the cut-stone work of the proposed public library building at Burlington. The structure is to cost $50,000.

Manager Cornick, of the Tennessee Producers' Marble Company, of Knoxville, Tenn., has resigned. His place has not yet been filled.

Maquoketa, Iowa.—Cowing & Ellyson, marble dealers, have dissolved partnership. R. M. Ellyson will continue the business.

Philadelphia, Pa.—The French Creek stone quarries have been leased on a royalty to P. H. Flynn & Co., of Philadelphia, who will quarry large quantities of stone for the Reading subway work.

Flemington, N. J.—John Ledger has sold out his stone quarries at Prallsville and Raven Rock to the Stockton Stone Company. The company is composed of the following: John Ledger, J. M. and J. F. Shanley, R. A. Montgomery and Richard B. Reading,

Cambridge, Mass.—John McNamee & Sons, marble works, W. A. McNamee retires.

Atlanta, Ga.—The Piedmont Marble Compady's property will be operated by a New York syndicate, who will open the quarry. Already invested, $300,000. New syndicate will improve the estate and begin to quarry the marble at once.

Detroit, Mich.—Meier Bros. & Co., stone contractors, reported to have been succeeded by Hubert A. Meier.

Quincy, Mass.—McKenzie & Patterson, granite, reported to have dissolved partnership.

Cleveland, O.—Mr. J. M. Worthington, the president of the Cleveland Stone Company, expressed himself a few days ago in relation to reports of a prospective consolidation of the sandstone interests of northern Ohio. He emphatically repeated his previous declaration that there is no truth in those reports so far as the Cleveland Stone Company is concerned, either officially or otherwise. He offered to wager that no consolidation of any kind would be consummated. The reports, he said, are giving him much annoyance, because owners of little quarry property all over the neighborhood are daily writing to him with offers of their property. The reports also, he claims, encourage people to go into the stone business,

STONE and MINING MACHINERY.

Stamp Mills,
Concentrating Machinery,
Smelting Machinery,
Lixivating Machinery,
Cyanide Machinery,
Rock Breakers,
Engines and Boilers

Traveling Cranes,
Derricks,
Derrick Powers,
Planers,
Lathes,
Wire Rope and Fittings,
Rubbing Beds.

Manufactured by

H. H. SCOVILLE & CO.,

CHICAGO,

TELEPHONE MAIN 4805. **250-252-254 South Clinton Street.**

Stone Sawing Machinery.

Gang Saws

Either Screw, Clogston or Gravity Diamond Saws, and Straight-Cut Gang Saws. Rip Saws.

CONTRACTS TAKEN FOR THE COMPLETE ERECTION OF SAWING PLANTS.

LINCOLN IRON WORKS,

NEW YORK OFFICE
HAVEMEYER BLDG.

RUTLAND, VERMONT.

Arithmetic for Stone Dealers.

Calculations Made Easy,
Errors Avoided,
Time and Labor Saved by

Ropp's
COMMERCIAL
CALCULATOR.

The most useful, complete and *practical* work on Figures ever published. Specially useful to stone, marble, granite and slate dealers and quarrymen. Nearly every problem in business *already figured out.* Arithmetic made so plain by *original*, short and simple methods, that a child can comprehend it. Worth its weight in gold to young and old. Nearly half a million copies sold. Accompanied by account book, silicate slate, pocket, etc. Bound in elegant leather, pocket size. Address

THE D. H. RANCK PUB. CO., 358 Dearborn St., Chicago.

Sent by Mail on Receipt of Price, $1.

will be removed, and the quarry hole allowed to fill up. The cranes are also to be taken down. This would indicate that this quarry is to be abandoned. The Brainerd, Shaler & Hall and the Middlesex quarries have closed till Jan. 1.

Peoria, Ill.—The Rev. P. A. Cool, formerly of Pontiac, is president of a company with $100,000, which is to operate a marble quarry in the Cherokee nation.

Chicago, Ill.—Capitalists interested in the pumice stone industry have decided to locate their plant in this city. Under the title of the Chicago Pumice Stone Company they will deal in the products of their mines and ship them to all parts of the country. The company lays claim to the ownership of the only pumice mines in the country, located at Great Salt Lake, and in southern Nebraska. Their Chicago plant will be built on the West Side.

Flemington, N. J.—The Goa Hill Quarry and Construction Company filed articles of incorporation with the county clerk of Mercer county last week. The capital stock is $25,000, and the company is to start with $1,500 paid up. The objects of the company are to quarry and dress rock and construct roads, bridges and other stone work, and own and improve real estate. It will get its stone at the quarries below Lambertville.

New York City.—Lamb & Co., of this city, is the name of a new company formed to carry on a stone cutting business. Capital, $2,500. The board of directors are as follows: S. S. Blaisdell, G. S. Bowman, of New York City, and William J. Bowman, of Paterson, N. J.

Indianapolis, Ind.—The Consolidated Stone Company, of Bloomington, has purchased the interests of the late Gen. Morton C. Hunter in the Morton C. Hunter Stone Company; consideration $21,385. The shares numbered 4,277.

Chicago, Ill.—James Dolese and Jason E. Shepard, members of the firm of Dolese & Shepard, crushed stone contractors, filed with Receiving Clerk Cochrane of the county recorder's office, two chattel mortgages aggregating $70,000. They were dated Jan. 11, 1896, nearly a year ago, but were not filed until Dec. 26. The first instrument is for $50,000 and is given on 150 gondola railroad cars which were used by the firm to carry crushed stone. They are marked with the firm's name and the "C., B. & Q. Belt Railroad." The second instrument is for $20,000 and is a mortgage on 104 of the same kind of cars.

Toronto, Can.—The Silica Sand and Gravel Company of Montreal have assigned to E. W. Gilman, with liabilities of about $25,200. E. Perkins is a creditor for $16,000, secured. G. Hyde & Co. are the next largest creditors, to the extent of $2,550. The remaining amounts range from $200 to $500.

Buffalo, N. Y.—Medina people will press several claims against the state. The Kearney Barrett quarries have filed a claim of $15.000. This is for land appropriated by the canals and alleged to be part of a valuable and unworked stone quarry.

Philadelphia, Pa.—The Midvale Slate Company, of which W. A. Winsboro, who absconded recently, was superintendent, near Easton, Pa., has made an assignment to Charles Shuman. The company's quarry is at Wind Gap, Northampton County, and the liabilities are $14,000.

Elyria, O.—The Cleveland Stone Company filed a mortgage with the recorder of Lorain county to the amount of $750,000 on their property located in Cuyahoga, Lorain, Summit and Erie counties. The mortgages were in favor of the Guardian Trust Company of Cleveland. "The Cleveland Stone Company," said Assistant Secretary C. W. McCormick, "is not contemplating any especial improvements. The filing of that $750,000 mortgage in favor of the Guardian Trust Company of this city is an old matter. We will in the spring make the usual changes and improvements, but they will include nothing out of the ordinary. Our business during the past year has been very dull, but we anticipate increased prosperity by reason of the general improvement of business and the loosening of the money market."

LaCrosse, Wis.—W. T. Symons, marble, reported to have made an assignment.

Columbus, O.—C. H. Hemming, monuments, reported to have recorded chattel mortgage for $130.

Dayton, O.—F. M. Davidson, mantels, etc., reported to have made an assignment.

Richmond, Va., December 5.—The Westham Granite company, owning large quarries and dressing sheds in Chesterfield county, has made an assignment to Charles U. Williams, of this city, and Col. Henry Douglas, of Baltimore, trustees, for the benefit of creditors. Col. Snowden Andrews, of Baltimore, who made a personal assignment in that city yesterday, is president of the company. The liabilities are $89,000. It is believed that the assets will pay the company out.

Baltimore, Md.—Col. R. Snowden Andrews, of this city, made an assignment for the benefit of creditors a few days ago in consequence of the financial embarrassment of the Westham Granite Company of Virginia. Colonel Andrews is the president of the company, which executed a deed of trust for the benefit of creditors about two weeks ago. He is also the principal owner of the quarries of the company, which are located near Richmond, Va, The company owes between $80,000 and $90,000, which it was unable to pay because of the lack of ready money and the refusal of further accommodation by the banks. This indebtedness is secured by notes indorsed by Colonel Andrews, who made the assignment for the protection of all his creditors. Mrs. Mary L. Andrews, wife of Colonel Andrews, joined in the deed, which conveys the interest of Colonel Andrews in the Westham quarries, land in Florida and property in Baltimore. Henry T. Douglas, of Baltimore, and Charles U. Williams, of Richmond, are the trustees. They bonded here for $30,000, double the estimated value of the property in this city, which consists of four lots on North avenue. It is thought the embarrassment of Colonel Andrews and the company will only be temporary, as the value of the quarry property greatly exceeds the liabilities, having been appraised recently at $500,000. The granite from the quarry has been used by Colonel Andrews in paving streets of Baltimore under contract. It has been used in laying what is known as the mosaic pavement.

Grand Rapids, Mich.—Ex-Alderman Alexander Matheson filed a trust mortgage Nov. 27 on his stock of marble and granite monuments, etc. Robert A. Matheson is named as trustee, and a long list of creditors is given, whose claims amount to $6,100, the largest creditor being Jeannette Matheson, for $1,007. Several claims for wages on the part of Mr. Matheson's employes, the amount of which is unknown, are also covered by the mortgage.

Concord, N. H.—W. H. Perry & Co., have purchased the Cummings granite quarry in Quincy. The firm has also negotiated for a half interest in the adjoining quarry, which was purchased about a year ago by Fraser & Co., of this city, and who have been operating it extensively during the present season. Perry's company have had some talk about buying the extensive Park steam lumber mill in Quincy and if they secure it it is reported that they will remove their entire granite plant from Concord to that place.

Troy, N. Y.—The sale of the McDonald Stone Company's plant and stock, which was to have been held last week, has been indefinitely postponed.

New Britain, Conn.—A new crusher plant will likely be built at the trap rock quarries of Luther B. Dorton of this place.

E. C. Fish is opening a stone quarry on his farm in Winfield, Wis.

R. B. Hinkly has opened a new stone quarry on the Mounds, at Lu Verne, Minn.

Fulton, N. Y.—William Patrick, of Phœnix, has secured a two-year lease of the brownstone quarry on the farm of Ingermell Bros. It is expected that operations at the qnarry will soon be commenced.

Hugh Fox has purchased a half interest in a new marble works at Litchfield, Iowa. The firm will be known as Robinson & Fox.

Torrington, Conn.—Preparations are in progress for the opening of a new granite quarry near here. It will be managed by M. Costello & Son, whose quarries near Crystal Lake are nearly exhausted. The new granite is said to be of fine quality and practically inexhaustible.

Middletown, Conn.—The terms of the transfer of the Brownstone Quarry Company to the Middlesex and the Brainerd, Shaler & Hall Quarry Company have been made known. The stockholders were paid the par value of their stock, $100 a share, payment to be taken in stone in which they are dealers, at any time within the next two years. The pump at the Connecticut Brownstone Quarry in Cromwell

and the reports, therefore, are very distasteful to him. Mr. Worthington has heard, he said, that some real estate man or lawyer is going around among the outside stone interests, and obtaining options upon their property. He supposes the purpose to be the formation of a single, or another company, in order, possibly, to have the Cleveland Stone Company buy them out at a fancy price. This man, he said, has never approached his company. Mr. Worthington also denied that it was to be used as a nucleus for a consolidation.

Red sandstone of the finest quality has recently been discovered a short distance from Mt. Vernon, Ind. It is claimed to be of great value in finishing up fine residences and other buildings.

LaGrange, Ind.—The syndicate of Cleveland capitalists which has purchased 500 acres of land in Branch county, Michigan, on which to locate a mammoth cement plant, has secured options on large tracts in St. Joseph and Cass counties, Michigan, and purchased land for a similar purpose in Steuben county, Indiana. Cement making promises to be one of southern Michigan's great industries and plants which will be operated will give employment to about 1,000 men.

Fredericksburg, Va.—The owners of the battlefield Granite quarries, near this place, have opened up a seemingly inexhaustible ledge of the fine "blue" granite.

Milwaukee, Wis.—A new stone quarry has recently been opened about one mile east of Spring Lake, Waushara county, and is now putting out about 1200 paving blocks per day.

Easton, Pa.—The Central Cement Company has been organized at Allentown with a capital of $100,000. The directors are: John V. Ammerman, of Quakertown; Jacob Campbell, of Bingen; Samuel Smith, of Northampton; D. C. Lambert of Freemansburg; W. Lamonte Gillette Clinton A. Gorman and Edwin J. Lichtenwalner, of Allentown.

Kingston, N. Y.—P. H. Flynn & Co., of Brooklyn, contractors for the abutments of the new East River bridge, have just bought an extensive limestone quarry near Saugerties, where they will employ 100 men in quarrying the stone at once.

C. M. Clark & Co., of Urbana, Ill., will establish a branch marble and granite shop at Cayuga, Ind., about March 1st.

Ashtabula, O.—It is reported that the Berea Stone Co. has leased the quarries at Windsor, Mills.

Lisbon, N. H.—The Lisbon Granite Works begin operation Jan. 1st. W. R. Kilburn and E. T. Raymond are the prime movers in the enterprise, and are fitting their new works with first-class machinery and expect to do first-class work.

Adams, Mass.—C. A. Howland is thinking of opening another marble quarry at this place. The same vein of marble as that now operated by the Adams Marble company extends into this land. Nothing will be done before spring.

Louisville, Tenn.—The Poorbaugh & Jeffreys quarries, have been leased by Mr. Shook, of Pennsylvania, who will develope same; erect a marble mill. Eastern capital is reported interested.

St. Louis, Mo.—Western Stone Company, of St. Louis; capital, $12,500; incorporated by Louis H. Meyer, John J. Weber, James K. Taylor, and others.

St. Louis, Mo.—The H. Marquardt Marble and Granite Company has been incorporated. The capital stock is $10,000, of which Henry Marquardt holds 362 shares, Henry O. Marquardt, Jr., 36 shares, and Edward H. Rottman and August H. French one share each.

Pierre, S. D.—Arricles of incorporation have been filed for the East Sioux Falls Quarry Company; capital stock, $25,000; incorporators, George H. Perry, John C. French, Sioux Falls; Wiley V. Lowe, East Sioux Falls; R. M. Reynolds, Monson, Mass.; B. F. Vaughan, Providence, R. I.

Racine, Wis.—H. H. Edwards, a resident of this place for forty-two years, died Dec. 22, aged 72 years. He was born in Wales and established the three largest quarries Racine ever had.

Newark, N. J.—Powers & McGowan, granite, T. S. Powers deceased.

IT IS THE LAW.

Sub-contractor Bound by the Contract with the Owner.—The Supreme Court of Iowa recently said: "We hold that the owner may make such a,contract as he sees fit, so long as it is legal, and may make any provisions as to the time and manner of paymant he chooses, and such contract he has the absolute right to comply with, in all respects, regardless of his knowledge of sub-contractors, and that they have furnished labor and material which has gone into said building, unless he has by the terms of his contract reserved the right to discharge the claims of sub-contractors from the fund which would otherwise be due to the principal contractor. If this be not so, then the right to contract, without let or hinderance, so long as the thing contracted to be done is legal, is a barren right—is a right to be exercised only subject to the will of the Legislature, which may ingraft upon the contract of parties obligations to third parties (sub-contractors) which said contractors never dreamed of. In our judgment the Legislature has no such power of interference with the right of private contract, and it cannot thus create obligations against one party and in favor of another, in plain violation of the contract. This view, we think, is the proper and just one as to the meaning and effect of the mechanic's lien law when applied to a case where the facts are as shown here. We are aware that this is a step in advance of former holdings where the question of the knowledge of the owner as to sub-contractors and their claims has been deemed material; but such knowledge is immaterial when the contract provides as to the times payments shall be made thereunder, and they are so made, and there is no provision in the contract for the owners using money due the contractor in discharging his obligations to the sub-contractors."—Epeneter vs. Montgomery County, 67 N. W. Reporter, 93.

"Strikes" and Building Contracts.—While a building contract provides for the completion of the building by a specified time, "contingent upon strikes and boycotts," it protects the contractor against liability for unavoidable delay so far as it is due to strikes, and the strikes referred to are not limited to such as occur in the shops of the contractor. A strike having occurred in a shop where certain material had been contracted for by the contractor, he was not liable for not having placed his orders elsewhere.—Milliken vs. Keppler, Supreme Ct. App. Div., 38 N. Y. S. Reporter, 738.

HOISTING ENGINES.
GEARED LOCOMOTIVES
TRAVELING DERRICK CARS.
DERRICK IRONS ETC.

MANUFACTURED BY
THE JOHN F. BYERS MACHINE CO.
RAVENNA, OHIO. U.S.A.

THE ACCIDENTS OF LIFE

THE STAR ACCIDENT COMPANY

Write to T. S. QUINCEY, Drawer 156, Chicago, Secretary of the Star Accident Company, for information regarding Accident Insurance. Mention this paper. By so doing you can save membership fee. Has paid over $600,000.00 for accidental injuries.

Be your own Agent.

NO MEDICAL EXAMINATION REQUIRED.

I SEE YOU'RE BACK
from a trip over the
MONON ROUTE
Solid vestibuled trains Daily, heated by steam, illuminated by Pintsch light,
BETWEEN
CHICAGO
INDIAN'POLIS
CINCINNATI
LOUISVILLE
And the SOUTH.

Only line to
West Baden and French Lick Springs,
The Carlsbad of America.
W. H. McDoel, V. P. and Gen. Mgr.
Frank J. Reed, Gen. Pass. Agt.
City Ticket Office,
232 CLARK STREET, CHICAGO.

THE NEW YORK
PUBLIC LIBRARY
ASTOR, LENOX AND
TILDEN FOUNDATIONS.

From the wall painting in the Hotel De Ville, Paris.

PAINTING.

By P. V. Galland.

Reprint from *The Architect*, London.

STONE

VOLUME XIV. FEBRUARY, 1897. NUMBER 6.

*INSTRUCTION IN ARCHITECTURAL DRAWING.—III.

GRAPHICAL CONSTRUCTION.

THE painter, like the sculptor, employs in his composition natural forms, and the skillful and accurate representation of real objects is his main work. But the architect, like the musician, and like the potter, the weaver and other workers in the arts of design, himself creates the forms which he employs in his compositions, so that skill in representing what he sees is of less importance to him than the power to give shape to his own conceptions, to what is visible to the eye of his mind. We accompany these exercises in Tracing and Copying, accordingly, and employ the handiness they develop, by exercises in what, for lack of better names, we may call Graphical Construction and Graphical Discussion.

For these a few hours' preliminary discipline in drawing straight and curved lines, so that they shall be of even and uniform tenor, amply suffices. It is excellent practice to put down dots at random and to connect them by a firm and clear stroke, straight or curved. If the dots are set so that the result is a geometrical or decorative figure, or resembles a building, a vase, or any other object, so much the better.

Among the exercises given under this head are:

1. *A Diaper Pattern.* An oblong, about eight inches by twelve, is carefully laid out and each side divided into four parts. Then diagonals are drawn, cutting up the surface into diamonds, each side of which is then

*Original in *School of Mines Quarterly.* Revised copy furnished STONE by author.

STONE

VOLUME XIV. FEBRUARY, 1897. NUMBER 3.

*INSTRUCTION IN ARCHITECTURAL DRAWING.—III.

GRAPHICAL CONSTRUCTION.

THE painter, like the sculptor, employs in his composition natural forms, and the skillful and accurate representation of real objects is his main work. But the architect, like the musician, and like the potter, the weaver and other workers in the arts of design, himself creates the forms which he employs in his compositions, so that skill in representing what he sees is of less importance to him than the power to give shape to his own conceptions, to what is visible to the eye of his mind. We accompany these exercises in Tracing and Copying, accordingly, and employ the handiness they develop, by exercises in what, for lack of better names, we may call Graphical Construction and Graphical Discussion.

For these a few hours' preliminary discipline in drawing straight and curved lines, so that they shall be of even and uniform tenor, amply suffices. It is excellent practice to put down dots at random and to connect them by a firm and clear stroke, straight or curved. If the dots are set so that the result is a geometrical or decorative figure, or resembles a building, a vase, or any other object, so much the better.

Among the exercises given under this head are:

1. *A Diaper Pattern.* An oblong, about eight inches by twelve, is carefully laid out and each side divided into four parts. Then diagonals are drawn, cutting up the surface into diamonds, each side of which is then

*Original in *School of Mines Quarterly*. Revised copy furnished STONE by author.

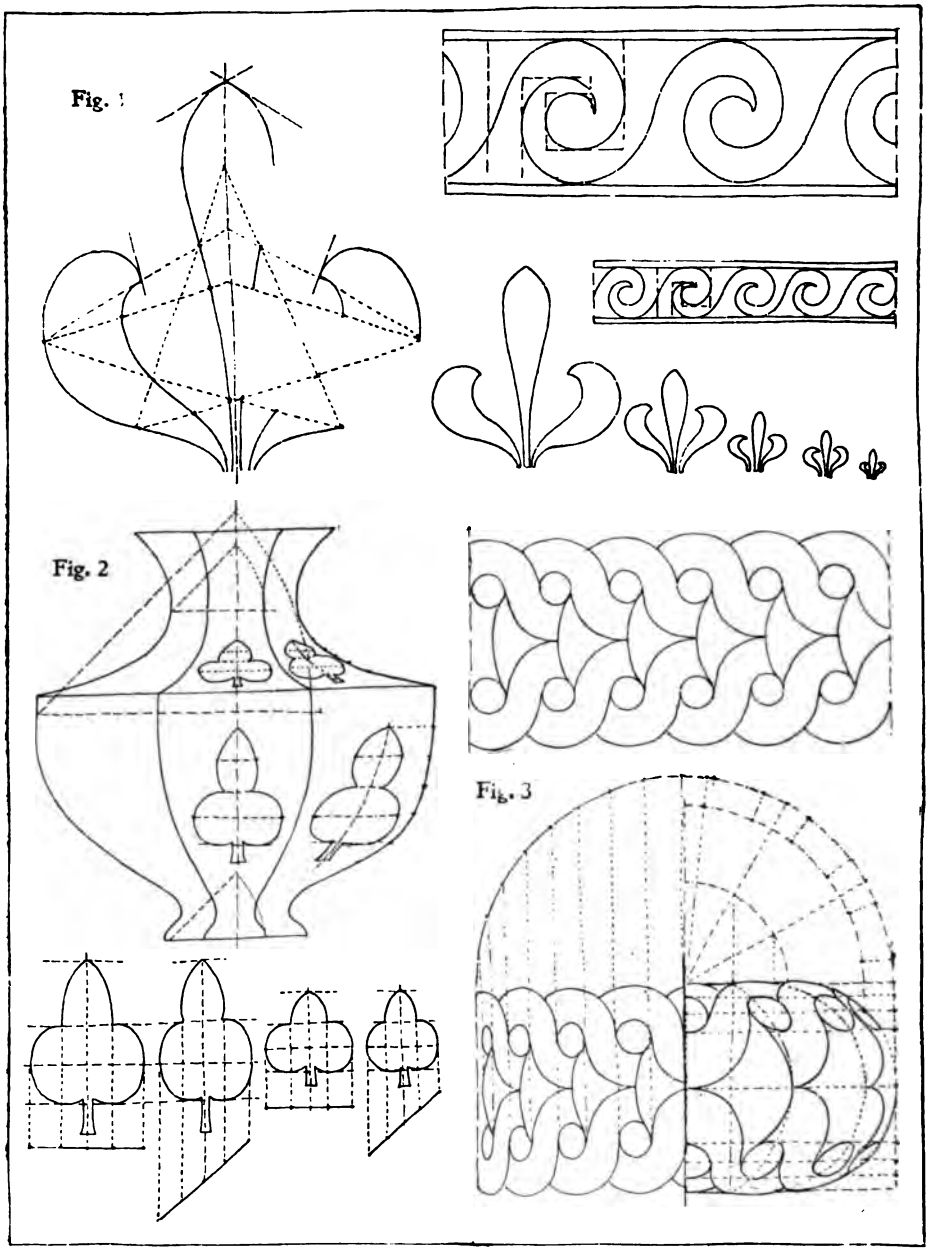


PLATE XIV.—GRAPHICAL CONSTRUCTION. (First Year). A. R., M. R. S.

Fig. 1. The Fluer de lys. Fig. 2. The Octagonal Vase. Fig. 3. The Guilloche.

This principle of working all over the field at once applies, of course, to any case of uniform repetition, such as, for instance, a row of Corinthian capitals. It is almost impossible, otherwise, to make them look alike.

2, 3. Practice in drawing geometrical curves is found in drawing a sphere, with great circles and small circles upon its surface, projected as ellipses, and in making diaper patterns of intersecting and concentric circles. These and other patterns are, like the first, shaded in two or three flat tints with parallel lines.

4. *The Fleur-de-Lys.* The fourth example affords practice in drawing curved lines of a freer character. A rough sketch is made on the blackboard, and each student draws as graceful and well-proportioned a *fleur-de-lys* as he can devise, studying the form with tracing paper until it suits his taste, and then carefully drawing half of it. The rest of the work consists in repeating these lines, reversing them so as to complete the figure. (Plate XIV, Fig. 1.)

To this end, instead of using guide-lines as auxiliaries, as is often done, roughly conformed to the shape of the figure, we take a hint from the differential calculus and indicate the points of maxima and minima, the points of contrary flexure, and the terminal points, or cusps, noting in the last two the directions of the tangents to the curve and the points where these tangents would cut the central axis, if prolonged to meet it. At the maxima and minima points the tangents are either vertical or horizontal, and do not need to be indicated, these points sufficing to give both the position and the direction of the curve at its highest and lowest parts and at its extreme limits right and left. If now, the direction of these several points from each other is noted, two and two, and the point where a line joining them would cross the axis is also indicated, it is easy to find the position of the corresponding points on the other half of the figure. These points give the position and direction of both ends of each portion of the curve that lies between them, and it only remains to connect these points by lines of a proper character, circular, elliptical or hyperbolic.

If a number of such figures are to be drawn, they need to be drawn simultaneously, as has just been suggested for Corinthian capitals, to secure similarity of touch. But in this exercise we generally avoid the tedium of doing exactly the same thing three or four times over, and yet secure the advantage of going through the same motions three or four times, by repeating the figure on a smaller scale. Each repetition takes less time than the last, and while rehearsing all that is most valuable in the experience, introduces a useful variety into the manipulations. It requires a nice touch to draw a *fleur-de-lys* only half an inch high.

5. *An Octagonal Vase.* Here also the form of the subject is left to

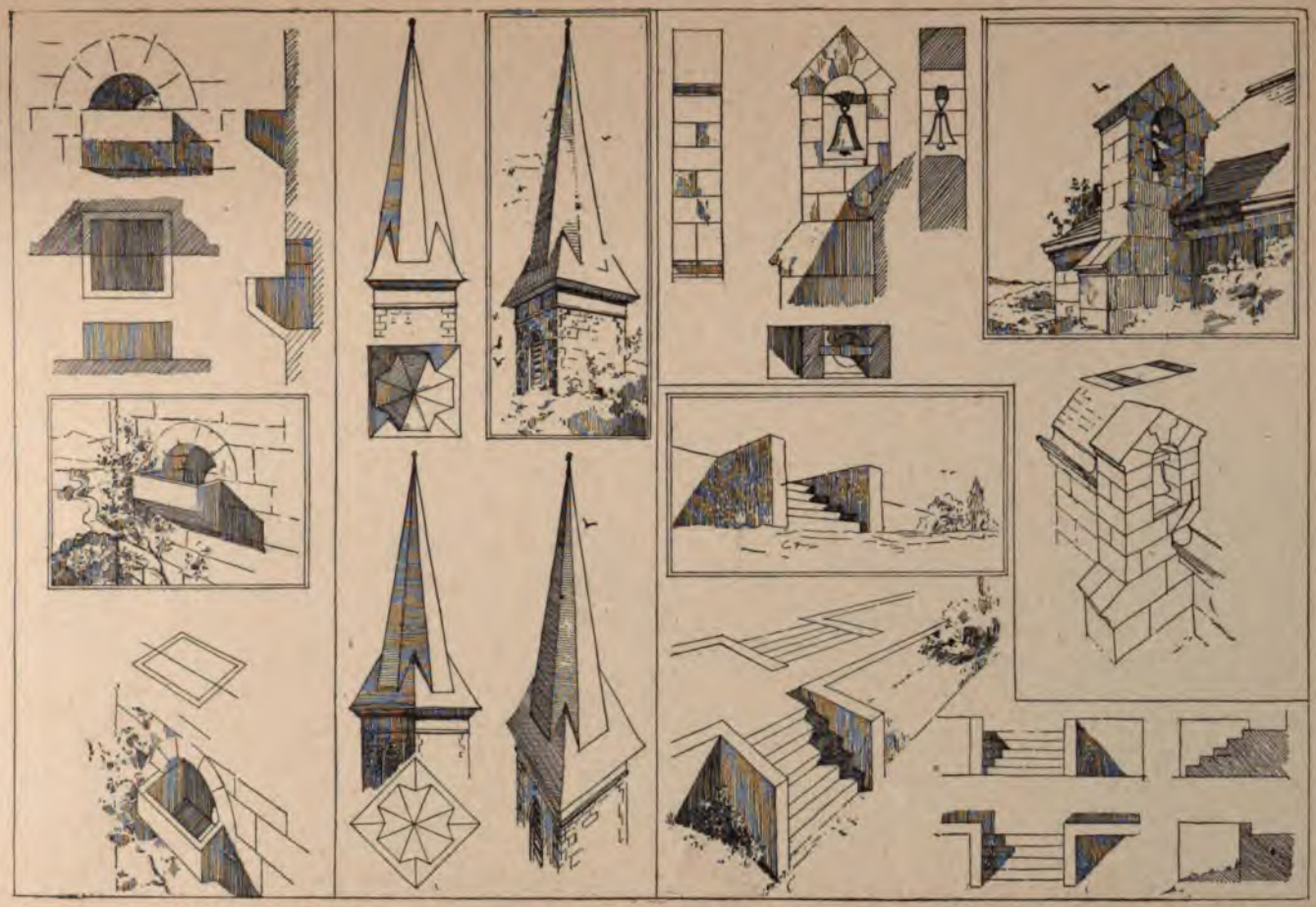


PLATE XV.—GRAPHICAL DISCUSSION. (First Year.) W. F. B., C. A. H., H. N. H. JR.

each student's taste and fancy. The outline of one side of the vase being determined, and its width, that is to say the position of its central axis, the outline of the other side is found as in the previous exercise. Points on one of the front corners of the octagon are then found for each different diameter by drawing a line at 45° from one extremity of the diameter to the axis and revolving it down. One of the corners may then be drawn through these points and the other copied from it. This is an admirable exercise in freehand projection. (Plate XIV. Fig 2.)

6. *A Guilloche.* This is drawn as a flat pattern, either single and double, and then again foreshortened, as if applied to a cylinder or torus. (Plate XIV. Fig. 3.)

7. *Leaves.* A plain leaf, drawn in three elevations, front, side, and at 45°, first flat, and then with the point bent over, is an excellent introduction to the study of the acanthus leaf in similar aspects. This prepares the way for the study of the Corinthian modillion, and this for the Ionic and Corinthian capitals.

In all these cases no copy is set, but a rough indication is given on the black-board showing the kind of thing to be done. Everybody's interpretation differs, of course, from everyone else's.

The elementary principles upon which this work depends are simultaneously taken up in a mere formal manner in the course in Projections, and are further illustrated and applied in the study of Shades and Shadows. Since architectural forms are for the most part made up of the regular geometrical solids, such as cylinders, cones and parallelopipeds, and since the light is, in an architectural drawing, supposed always to have the same direction, and the Shadows are generally supposed to fall upon vertical surfaces, it follows that the number of different shaped shadows that occur in practice is more limited than might be supposed. The same forms are constantly recurring, just as in multiplication the same factors are constantly furnishing the same products. Now just as, in arithmetic, it is worth while to tabulate these results and to learn the multiplication table by heart, so here it is a convenience to frame rules for these shadows, so that they may be drawn whenever they occur by memory. We find it in fact almost as easy to make rules for the shapes of the shadows as for the shape of the columns and entablatures themselves, and they are as easy to learn as to make. These rules transfer the subject of Shades and Shadows from the field of geometry to that of draughtsmanship and enable a student to put them into his work as readily as the forms that cast them. The forms of both substance and shadow thus become so familiar that only care and attention are needed in drawing them, not computations and reasonings.

These exercises excellently exemplified the kind of drawing which is

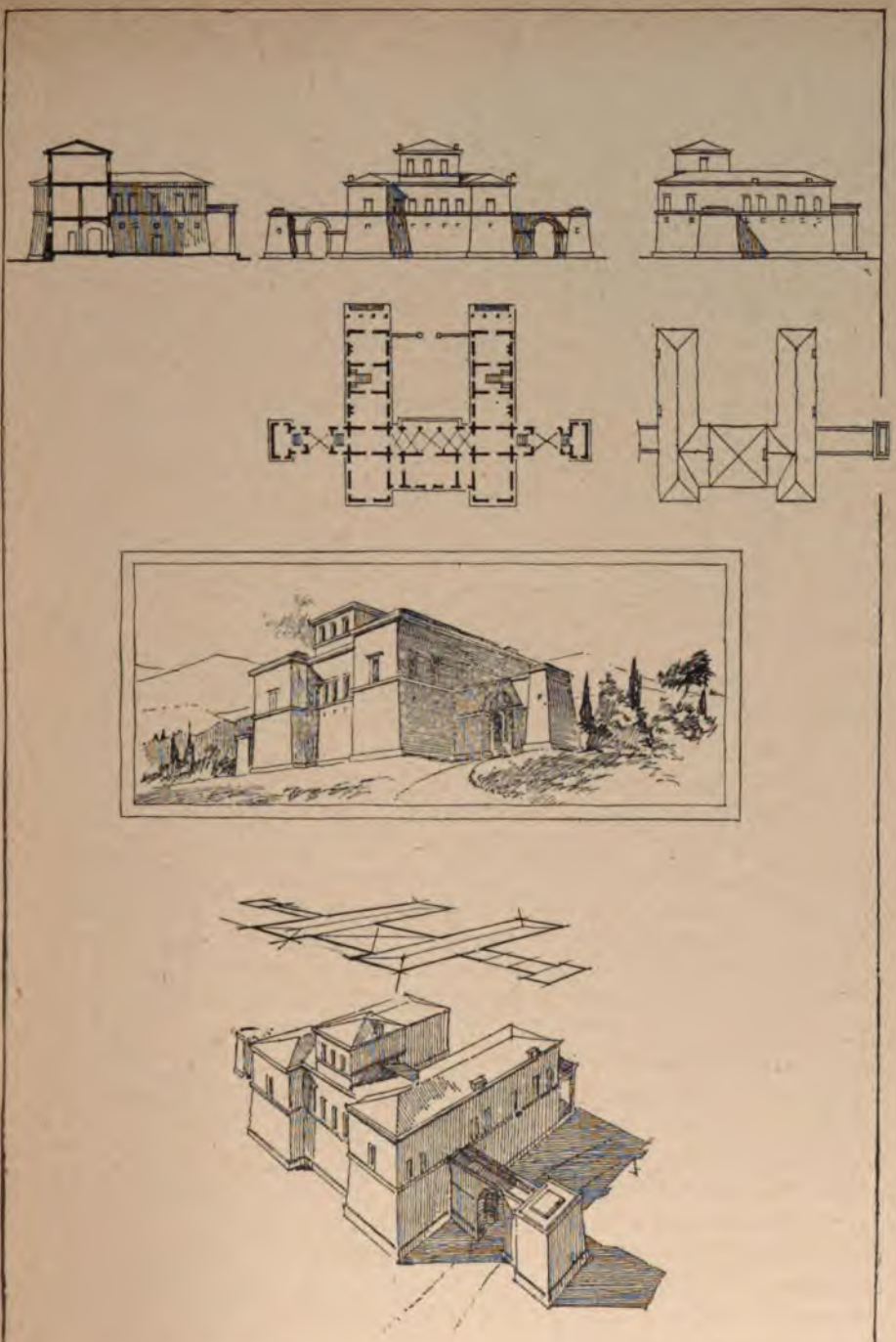


PLATE XVI.—GRAPHICAL DISCUSSION. (First Year.) W. F. B.

Plan and elevation given. The rest inferred.

specially characteristic of the Architect. Every line, though executed with the free hand, is determined in shape, size and position by geometrical considerations. Thoughtless and careless work is out of the question. Draughtsmanship of this sort is an intellectual exercise. It has an educational value quite apart from its practical uses.

The habit of thinking with the pencil in hand which these exercises tend to foster, and of giving to every form as it presents itself to the imagination a concrete existence, is indeed a habit eminently conducive to clear and consistent thinking on every subject into the conception of which the idea of space naturally enters. Even in Geometry, Analytical Geometry, and the Calculus, students and teachers are much in the habit of saving themselves the trouble of making drawings and of relying upon the vague images formed in their minds by a not too representative imagination. In Mechanics especially there is a particular advantage to clear thinking in substituting the forms of things for names. But even in Arithmetic and Algebra the relations of abstract quantities, too often hidden behind the apparently perspicuous grammar of the phrases in which they are stated, may be made surprisingly obvious if translated into the language of form.

IV. GRAPHICAL DISCUSSION.

The next procedure has still more distinctly an educational and disciplinary character, inasmuch as it exacts, besides accuracy of hand and eye, a still larger measure of mental activity. It consists of a series of exercises in which the object drawn is depicted in every variety of aspect, a simple barn or dog kennel, for instance, which is the object generally chosen to begin with, being shown in plan, with three elevations, two sections, a plan of the roof, a perspective plan, a perspective view and a bird's-eye view; ten sketches in all, all with the shadows cast. After two or three of them are drawn it is easy enough to do the rest. The labor of understanding the forms is at a minimum, but to maintain consistency of size and proportion among them all requires a constant observance of their relations. (Plate XV.)

The exercises under this head begin with simple forms, such as a barn, pyramid, or other geometrical solid, and go on to steps, chimneys, belfries, towers and spires, and finally to buildings and parts of building of any degree of complexity. Their value as affording practice in thinking in three dimensions, in conceiving an object in the solid, and distinctly apprehending its various aspects, will readily be understood by any one who knows how difficult it is for many persons to exercise their minds in space They not only cultivate the imagination, however, but, by affording a complete graphical discussion of every object taken up, tend to form a habit of thorough and exhaustive investigation which is of real educational value

It is largely because the Classical Languages and Mathematics and the Natural Sciences afford examples of exhaustive discussion that these studies are accorded the place they hold in general education. An exhaustive graphical treatment of any object is not less exemplary, and for the student of Architecture it can hardly fail to be of special and immediate service. A designer trained in this discipline is hardly likely to rest content unless he knows how the back or side of his building is going to look, and is likely to feel uncomfortable unless he can see, in his mind's eye at least, how his roofs are going to go.

Meanwhile the student is obtaining much valuable experience; his knowledge and comprehension of form is enlarged, and the phenomena of Projections, Shades and Shadows, and Perspective, become so familiar through mere use and observation that when these subjects come to be systematically studied he finds himself upon familiar ground. Being already accustomed to the facts he finds it comparatively easy to comprehend the laws that they illustrate.

The extension of these discussions to the study of whole buildings, upon a small scale, easily follows, and forms an instructive experience in planning and in the composition of masses. (Plate XVI).

After one or two plates have been traced or copied so that the method may explain itself, it suffices to give the student two or three sketches, showing the object in two or three aspects. These are enough to start with. He then works out the other half dozen drawings for himself, inferring what can be inferred from the data furnished, and supplying the rest from his reason and imagination, or from the memory of previous studies.

By including in the series the details of the classical orders these forms also are made familiar. The student becomes acquainted with them in themselves, as works of art, in advance of taking them up scientifically and learning their numerical proportions. The numerical relations of these parts are indeed important and necessary to know. But this knowledge should come merely as an auxiliary and as a safeguard against error, after acquaintance has been made with the forms themselves and the student has learned to draw them from memory and to care for them for their own sake.

Prof. William R. Ware.

[TO BE CONTINUED.]

CENTRAL MARYLAND GRANITES.—V.

ECONOMIC BEARINGS.

THE granite yearly quarried in the State of Maryland, according to the Eleventh Census report, recently published, amounts to about 3,371,000 cubic feet, valued at $447,480. Thus, among the States of the Union, Maryland ranks eleventh as a producer of granite. These rocks, therefore, assume considerable importance from an economic standpoint, in addition to the purely scientific interest they possess.

Although as a whole the granites have a very limited surface extent as compared with the other crystallines of the State, the different granitic areas are widely separated geographically. They furnish the most durable building stone of the region, and consequently, in all heavy masonry, massive architectural work, and in paving this rock figures largely.

The granite industry of Maryland is constantly increasing, the material being supplied not only for local use, but for shipment, beyond the boundaries of the State. Yet the activity in this direction, is not developed to the extent that it might be, for with the excellent railroad facilities Maryland granites should be more widely known than they are.

In the different granite districts the quarry industry is very unequally developed. This is probably due largely to accidental location as regards facilities for transportation, local markets, and means for removing the rock, rather than to any special inferiority of the respective deposits.*

Port Deposit.—The foliated biotitic granite which outcrops so extensively along the Susquehanna River in Cecil and Harford counties furnishes nearly one-half of the entire amount of granite quarried in the State. The rock of this region has been taken out in commercial quantities for more than three-quarters of a century. The output of the Port Deposit district during the year 1892 was nearly 80,000 tons, valued at about $220,000. Although somewhat gneissic in its character, the rock as a building stone is very durable. According to the tests made by the United States engineers, it withstands a crushing strain of over 18,000 pounds per square inch. Among the constructions built of this rock may be mentioned Fort Monroe and the artificial island opposite it on which Fort Wood was erected; Forts Carroll and McHenry, Baltimore; Fort Delaware; the sea wall at St. Augustine, Fla.;

* See Maryland: Its Resources, Industries, and Institutions, pp. 124-128 (Baltimore, 1893), for local history of the development of the stone industry in the state.

the navy-yard and dry dock of Portsmouth, Va.; the Naval Academy at Annapolis, Md.; the foundations of the Treasury building, the Baltimore and Potomac Railroad station, and St. Dominic's church at Washington; the bridges over the Susquehanna at Havre de Grace, Md,; the Chestnut Street, Girard Avenue, Callowhill, and South Street bridges over the Schuylkill at Philadelphia; the principal bridges at Baltimore; and the new water-works crib at Chicago. It has also been used in the construction of the entire plant of the Maryland Steel Company at Sparrow Point, Md.; at Haverford College; and in a large number of private and public dwellings in Baltimore and Philadelphia.

Gunpowder River.—The gray gneissoid granite of this area has not as yet been quarried extensively, though railroad facilities are excellent, the Baltimore and Ohio passing but a short distance from some of the best ledges. Openings have been made at several points, however, and a local demand for foundations and retaining walls supplied.

Texas.—The squeezed granite of this district has not been used much, and only a little of the rock has yet been quarried. It is not probable that this rock will ever be used to any great extent, as exhaustless quantities of good gneiss occur nearer the railroads and chief markets, and are, moreover, extensively quarried at and near Baltimore.

Relay.—Although small openings have been made within the limits of the district, little rock has been taken out. At the present time no quarrying of any kind is going on.

Guilford.—The light colored binary granite of Guilford, while evidently an excellent rock, is a couple of miles from railroad facilities, almost too far to compete successfully with localities more favorably situated. Three small quarries are in operation. Besides supplying local demands, the stone is hauled a mile and a half by wagons to the town, which is at the end of a long switch from the Metropolitan Branch of the Baltimore and Ohio Railroad, and there loaded on cars for transportation. The beautiful red granite reported from this place is found upon examination to be merely a surface staining of the typical white rock.

Ellicott City.—Recently considerable quarrying has been done in this area, the output for the year 1892 being valued at $22,500. The outcrops are almost continuous for several miles along the Patapsco River, from Ellicott City to Ilchester. Near the former place the chief openings are the Werner and the Wilson quarries. A number of important buildings have been erected with the stone from this district. Among them may be mentioned the Cathedral at Baltimore, Ammensale College in Prince George County, and many substantial structures in Ellicott City.

Dorsey Run.—No quarries are in operation at this place, and the only

rock taken out was used by the Baltimore and Ohio Railroad to protect the roadbed against the swift current of the Patapsco.

Woodstock.—Economically the granite of this district is one of the most important in the whole state. Its uniformity in grain and color, and the ease with which it can be obtained in blocks of almost any size make it one of the most desirable of the granitic stones for building purposes. Quarrying has been carried on for upwards of sixty years. The first great impetus to the indusrry was given by the building of the Baltimore and Ohio Railroad down the Patapsco Valley, dressed stone stringers and material for bridges and culvert work being in demand. There are two principal quarries, the Waltersville and Fox Rock, besides several smaller openings. In the former extensive improvements have been made recently, steam being used for pumping, hoisting, drilling, and sawing the rock, and also for transporting it to the main line of the Baltimore and Ohio Railroad, two miles distant.

It is said that fully three-fourths of the stone used for fine granite work in the city of Baltimore, has been procured at the Waltersville quarry. The same stone has also been used largely in Washington. Among the public buildings into whose construction it has in part at least entered may be mentioned the Capitol, Patent Office, Post-Office, and the new Library of Congress building. The stone from the Fox Rock quarry has also been used largely in Baltimore. Among the principal buildings constructed of it the Central Building of the Baltimore and Ohio Railroad and the Fidelity Trust and Deposit Building may be mentioned.

Sykesville.—Only one opening of any extent has been made in the granite at Sykesville. This is the Weller quarry, located about a third of a mile east of the Baltimore and Ohio Railroad station. At the present time no work is going on. A year ago Belgian paving blocks were taken out quite extensively. None of the stone was used for building purposes except for ordinary foundation walls.

Garrett Park.—Immediately north of the railroad station, on the south bluff of Rock Creek, considerable granite of a light color and of somewhat gneissoid structure has been quarried for local use. A couple of miles farther up the creek, near Halpin Station, a quarry has been opened in a very light-colored, almost white, granite, which is fine grained, and even textured. The stone is of excellent quality and color and is used chiefly in Washington. The demand for the rock for fine building is rapidly increasing. North of Garrett Park two or three miles are more good exposures of an even textured, rather fine grained hornblende granite. Small quantities of the rock have been taken out for local use, but no extensive quarrying has yet been done.

Charles Rollin Keyes.

[TO BE CONTINUED.]

IE HISTORICAL DEVELOPMENT OF STONE BRIDGES.

FIG. 1.—GREEK FALSE ARCH.

THE first stone bridges were simply blocks of stone laid horizontally over an opening. Such bridges are still used for spanning narrow openings, and in some countries for crossing streams of not inconsiderable width. In buildings, this is still the most common mode of spanning an opening. The next step was to corbel out, letting one stone project beyond the one beneath it, and in this manner, spanning larger openings than would be possible with one stone alone. The next step was to cut off the lower projecting corners of these corbelled stones, making a structure in appearance like an arch—a so-called false arch—though in principle it is not in any sense a true arch. These false arches were used by the Egyptians, the Assyrians, the Greeks, and other older nations. Fig. 1 shows a Greek structure of this kind.

The principle of the arch appears to have been known to the Assyrians and to almost all of the older nations whose structures have become known to us. All of the Assyrian arches thus far discovered are of brick, the bricks being made of a wedge-shape, or thicker at the outside than at the inside. Most of the arches were semi-circular, and the maximum span found is 15 feet. The only pointed arch discovered in the Assyrian ruins is built of brick of the ordinary shape, the joints being thicker on the outside; while instead of the keystone, ordinary bricks were laid longitudinally between the two sides. The arch was used by the Assyrians for doors, gates, drains, aqueducts, and chambers or galleries.

Still earlier than the Assyrian arches, which belong to about the ninth century B. C., were the brick Babylonian arches, as early as 1300 B. C., while in Egypt arches were known as far back as the fifteenth century B. C. The early Egyptians, however, though undoubtedly acquainted with the arch principle, avoided arches, and seem not to have fully grasped the idea of using

---

* Prof. George F. Swain, President of the Boston Society of Civil Engineers. Lecture delivered before the Association of Engineering Societies, June 17, 1896.

a large number of thin stones laid with the long sides touching. The Hindoos to this day refuse to use arches. They have a saying that "the arch never sleeps," meaning by this that it continually exerts a horizontal thrust upon its supports, tending to disintegrate and destroy them. This quaint saying is true and suggestive. The arch will not withstand the ravages of time as well as the structure which causes only vertical pressure upon its supports. Any yielding, decay or defect may result in the collapse of the entire structure. The Egyptians, then, who also attached weight to this principle, never applied the arch on a large scale, or to large edifices.

FIG. 2.—FABRICIUS BRIDGE AT ROME.

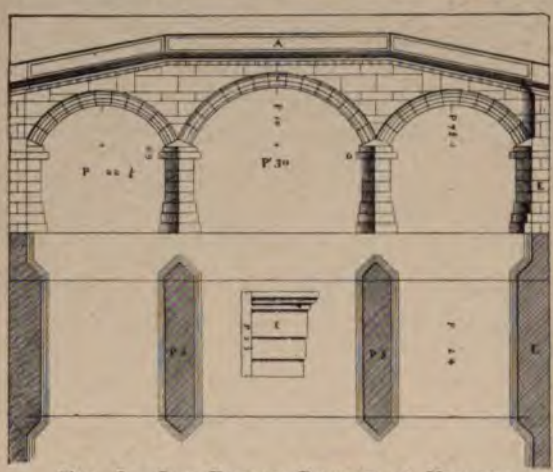


FIG. 3.—OLD ROMAN BRIDGE AT VICENSA.

To the Romans is due special development of the arch, and its application on a large scale in the construction of viaducts, aqueducts, sewers, buildings and bridges. One of the earliest of their arches was the Cloâca Maxima, a sewer which is still in use and in good condition. The arch consists of three rings of stones, and its construction shows a perfect appreciation of the principles involved. The Romans built many arch bridges over streams, one of the bridges over the Tiber having a span of 84 feet; while the Emperor Augustus constructed a bridge of five spans over the river Marachia at Rimini. Between Rome and Gâbii there was a viaduct with nine arches. Fig. 2 shows one

FIG. 4.—BRIDGE OF ST. CHAMAS.

which they were protected was not effective; in a word, their foundations were imperfect.

The arches of the Roman bridges were almost always semi-circular; in exceptional cases they adopted flattened curves, whose rise was never made less than one-third of the span. In general the extrados was parallel to the intrados, and the thickness of the arch ring at the crown was on an average about one-twelfth of the span.

The number of arches in the Roman bridges was generally uneven, and

FIG. 6.—PONT DU GARD, AT NISMES.

the central arch had a larger span than the others. Often the spans decreased progressively from the center of the bridge to the ends. Under these conditions the roadway above could only be made horizontal, with the same depth of filling above each arch, when the springings of the arches were placed at different levels, and higher toward the ends. In general, however, they preferred to place the springing lines of all the arches at the same level, making the roadway incline from each end toward the center,

FIG. 7.—OLD ROMAN AQUEDUCT AT SEGOVIA, SPAIN.

FIG. 8.—BRIDGE OF ST. BENEZET, ACROSS THE RHONE AT AVIGNON.

FIG. 9.—KARLSBRUCKE AT PRAG.

sometimes with an angle at the center, and sometimes with a horizontal portion above the center span. The contraction of the waterway due to the thickness of the piers was in part made up for, in some cases, by openings through the masonry above the piers or in the haunches. (Fig. 2.) But while the excessive thickness of the piers of the Roman bridges had the effect of increasing the danger of undermining, it resulted in the advantage that each pier was able to resist the thrust of the arch on either side of it, even though the arch on the other side should be destroyed. The fall of one arch, therefore, did not result in the fall of the adjacent arches, as would be the case in many modern bridges. The piers were made triangular at each end, or sometimes semi-circular. The bridges carrying roads were provided with continuous solid parapets.

In the arches, as well as in the other masonry structures of the Romans, the stones were laid dry, that is, without beds of mortar. Moreover, each arch was frequently made up of several rings of arch stones not bonded, or connected together in any way. Some of these bridges are still in existen

nd differ comparatively little from the modern structures. Many of these oman bridges were adorned with statues on the piers and on the approaches.

The most important of the Roman bridges, however, were in connection ith the aqueducts which supplied the cities with water. There were nine f these aqueducts supplying ancient Rome in the time of Frontinus, "Cu-ıtor Aquarum" from 97 to 106 A. D. The first was underground and was uilt by Appius Claudius 312 B. C. The second was also underground and as built forty years later. The third, or Martain aqueduct, was built 144 . C., by Quintus Martius, and was partly above ground, and its remains ıay still be seen. It had nearly 7,000 arches in a course of 39 miles, with ɔans of 16 feet. It was constructed of different kinds of stone, red, brown ıd yellow. The arches in many places were more than 70 feet in height. he aqueduct was built so strong that the two succeeding ones were built ı top of it, thus giving three tiers of arches, one above the other. The xth aqueduct was constructed by Agrippa, in 33 B. C. The seventh was uilt by Augustus. The eighth, or Claudian aqueduct, 45 miles long, and

FIG. 10.—ANCIENT BRIDGE AT KREUZNACH, GERMANY.

the ninth, 62 miles long, were both begun by Caligula, A. D. 38, and completed by Claudius, A. D. 52. Along the greater part of their course they are carried on the same line of lofty arches with spans of about 20 feet, the highest of all the aqueducts supplying Rome. Magnificent remains of the Claudian aqueduct, built of massive blocks of tufa, still exist for many miles across the Campagna. (Fig. 5.) "A great number of these arches

FIG. 11.—BRIDGE OF ALCANTARA, TOLEDO, SPAIN.

are still in good preservation, with, in places, later arches built under them by Severus in 201, probably to support them after injury by an earthquake." (Middleton.) The two other aqueducts were built later, the Aqua Trajana, built by Trajan, A. D. 109; and the Aqua Alexandrina, built A. D. 226, by Severus Alexander.

In addition to the aqueducts which supplied Rome, the Romans built many other aqueducts, among which may be specially mentioned that at Nismes, in Southern France, and those at Segovia and Tarragona, in Spain.

FIG. 13.—BRIDGE AT TOURNAI, BELGIUM.

FIG. 14.—TRINITY BRIDGE AT FLORENCE.

upper of one. The arches thus consisted of separate narrow arches side by side, not bonded or connected together. The structure is constructed of freestone with rubble filling in the piers and spandrels. The stones were laid without cement, and projecting stones were left to support the centers. The dimensions of the channel are 4 feet wide and 4 feet 9 inches high. Above the small arches of the upper tier cement was used in the rubble masonry about the channel. This cement has become as hard as the stone

FIG. 15.—BRIDGE AT ISPAHAN, PERSIA.

itself, forming one impermeable mass, and preventing any filtration. This beautiful structure was partly destroyed at the ends, at the beginning of the fifth century, by the barbarians who besieged Nismes. In 1743 it was repaired and the piers prolonged to carry a new bridge. The entire length of the aqueduct of which this bridge forms a part is over 25½ miles. The fall given to the water along the entire length is 0.04 feet per 100 feet, and is uniform throughout. This great work of engineering will compare favorably with any of modern times. It shows that the Romans understood

thoroughly the art of leveling, and much more of the science of hydraulics than we generally credit them with. Considering the state of physical science at that time, the skill and care displayed in this and other similar works is little short of marvelous.

The aqueduct of Segovia, Spain (Fig. 7.) was built by the Emperor Trajan, and is of squared stone laid without mortar, crossing a valley with a length of more than 2,500 feet. It is in many places nearly 100 feet high. This aqueduct has 109 arches, of which 30 are modern, but like the old ones. It has carried water up to a very recent date, and possibly may still be in use. The aqueduct at Tarragōna is similar, and of about the same height, with 25 lower arches and 11 upper arches.

One of the most famous Roman bridges is the Bridge of Alcantara, across the Tagus near Alcantara, close to the frontier between Spain and Portugal. It is said to have been built by Trajan about 98 A. D., and had six semicircular arches, with one center span of 115 feet, with a height of 203 feet above the river. The masonry was dry.

Another work which is sometimes described is the so-called mole of Caligula, the remains of which may still be seen in the bay of Pozzuoli, near Naples, and which is thought by some to have extended entirely across the bay to Baie. Thus Palladio, writing in 1570, said: "But among all of the celebrated bridges, that is recorded as a marvelous thing which Caligula made from Pozzuoli to Baie in the middle of the sea, in length somewhat less than three miles; in which they say he spent all the money of the Empire." The history of this work, however, is imperfect and confused; no one knows who built it or conceived it, and it was already in a considerable state of dilapidation at the time of Hadrian, so that it appears certain that Caligula did not build it or even repair it, but at one time had a bridge of boats constructed across the bay from its seaward extremity, upon which he built a paved roadway similar to the Appian way.

It is evident from these examples that the Romans were masters of the science of engineering so far as concerns the construction of stone bridges and of aqueducts, and history shows that their skill extended to other branches as well.

After the fall of the Western Empire there was little bridge building in Europe until the twelfth century, when the increase of travel, together with the rapid development of cities and of trade, rendered imperative better facilities for crossing streams.

In France a religious association known as "Brothers of the Bridge," was founded by Benedictine monks, and flourished especially during the twelfth and thirteenth centuries. By this order the building of bridges was assumed as an act of piety. They established houses for the accommoda-

tion of travelers at the stream crossings, acquiring means for constructing bridges, and in some cases superintending their erection. One of the earliest bridges built by this organization was at Durrance, but due consideration not having been given to the waterway, it was soon demolished by floods. Another, known as the Bridge of St. Benezet (Fig. 8), and the funds for which were obtained by a pretended miracle, was built at Avignon, over the Rhone, having been begun in 1177 and completed in 1187. This bridge is said to have had twenty-two arches and was 2,000 feet long, and only 13

FIG. 16.—CHINESE BRIDGE.

feet wide between parapets. The largest span was about 110 feet, and the arches were segmental. In 1385 Pope Boniface IX had some arches of the bridge destroyed for his own safety, and various mishaps resulted in the destruction of others. In 1410 the inhabitants blew up the tower, which carried down three other spans, and in 1670 the river carried away several more. There are now only the remains of a few arches.

Many other bridges were built by the "Brothers," among which may be named those of St. Esprit, Ceret, Nions, Castellane, Villeneuve d'Agén,

and a remarkable bridge at Vielle Brioude, over the Allier, built 1454, with one arch having a span of 183 feet, and a rise of 70 feet. Only the arch ring was of cut stone, and it was quite thin, the rest of the masonry being of rubble. The piers above high-water were faced with stone on the outside, the inside being filled with sand and gravel. This bridge was reconstructed about the middle of the present century.

Of all these bridges built between the twelfth and sixteenth centuries, it may be said that it is remarkable that they stood as well as they did. They were cheaply constructed, and very narrow, seldom 20 feet in width, gen-

FIG. 17.—BRIDGE AT BORDEAUX, FRANCE.

erally not over 13 to 16 feet, and sometimes but 6 or 7; the piers were very thick, and the spandrels either perforated, or filled with earth.

In several bridges of this period Gothic or pointed arches were used. Thus the bridge over the Ticino, at Pavia, built in the fourteenth century, under Galeas Visconti, Duke of Milan, had seven equal spans of 70 feet with a rise of 64 feet. The piers were about 16 feet thick. This bridge was built of brick, and was covered, the roof being supported by marble columns. It is, however, not now in existence. The present structure is

itself several centuries old, and has six arches, the maximum span being 100 feet.

Other notable bridges of the Middle Ages were the bridge over the Danube at Ratisbon, built in 1133, with fifteen semi-circular arches varying in span from 33 feet to 53 feet; the bridge over the Elbe at Dresden, built in the twelfth century and restored about 1730, in which the thickness of the piers was almost as great as the spans of the arches; the old bridge over the Moldau at Prague; and the old bridge over the Main at Würzburg. Fig. 9 is a view of the Karlsbrücke at Prag, showing principally the tower at the end. This bridge has sixteen spans, and was built between 1357 and 1507. It was partially destroyed by a flood in 1890. As shown in the picture, it is ornamented by thirty statues and groups of saints, including a bronze statue, in the center, of St. John Nepomuc, the patron saint of Bohemia, in whose memory the bridge is visited yearly by thousands of pilgrims. The saint is said to have been flung from the bridge in 1383, by order of the Emperor, for refusing to betray what the Empress had confided to him in confessional. The body is said to have floated for some time in the river, with five brilliant stars hovering over the head.

Fig. 10 shows an old bridge at Kreuznach, with buildings over the piers.

Perhaps to us the most interesting bridge built within this period is the old London bridge over the Thames, built by Peter of Colechurch. This bridge was begun in 1176 and finished in 1209, and was 926 feet long and 40 feet wide. It contained a drawbridge and nineteen pointed arches, varying in span from about 9 feet to 20 feet, with massive piers, varying from 25 feet to 34 feet wide. The obstruction caused by these large barriers, and the large number of piers, reduced the entire channel of the river from its normal breadth of 900 feet to a total waterway of 194 feet, or less than one-quarter. It is said that this obstruction caused a fall of water at the bridge of about 5 feet. Only eighty years after its completion this bridge was in such bad condition that men were afraid to pass over it, and the houses on top had arches built between them to hold them together. In 1758 the houses were removed, and a large arch constructed in place of two smaller ones. In 1738 the Westminster bridge was begun, and completed in 1749. This was the second bridge over the river; but it did not relieve the traffic sufficiently, and repairs were made on the London bridge, at a cost of £100,000. In 1824 to 1831, the new London bridge was built, consisting of five semi-elliptical arches, with two spans of 130 feet, two of 140 feet, and the central one of 152 feet 6 inches, and a rise of 37 feet 6 inches. This was the largest elliptical arch built up to that time.*

*The roadway of this bridge was 52 feet wide. It was built just above the old bridge, and was designed by John Rennie, and built by his sons, John Rennie and Sir George Rennie, at a cost of £426,000.

To the mediæval period belongs also the Ponte Vecchio, over the Arno, in Florence, built originally in 1177, but reconstructed in 1345. It has three segmental arches, with spans of from 85 feet to 94 feet 6 inches, piers 20 feet 4 inches thick, and a depth of keystone of 3 feet 3 inches. Its breadth is 105 feet, and it carries a covered gallery, constructed by the Medici, forming the continuation of a passage from the Pitti palace to the old Ducal palace, with stores on the sides, originally intended for goldsmiths' shops. This is one of the first mediæval bridges which is segmental.

The largest stone arch span constructed up to the present day was found

FIG. 18.—AQUEDUCT NEAR LISBON, PORTUGAL.

in a bridge built in 1377 by Barnabo Visconti, at Trezzo, over the Adda, which was destroyed in a local war in 1416. It was fortified and defended the approaches of the castle of Trezzo. It was a segmental arch, with a span of 237 feet, and a rise of 68 feet.

In Spain, the Middle Ages saw the construction of several remarkable works. The bridge of Alcantara, over the Tagus at Toledo (Fig. 11.) was

FIG. 19.—PONT NEUF AT ALBI, FRANCE.

FIG. 20.—BRIDGE OVER THE NYDECK, AT BERNE, SWITZERLAND.

built in 997, and has one large span of 93 feet, adjoining which is a small span of 52.5 feet, both semi-circular. The tower has a Moorish aspect, but the general character of this structure is Roman.

The St. Martin bridge, over the same river and in the same city (Fig. 12), built in 1203, is still more picturesque. The central arch is pointed, with a span of 132 feet, though the angle at the top is scarcely perceptible. Of the adjacent arches, some are pointed and some semi-circular.

In comparing the bridges of the Middle Ages with those of the Romans,

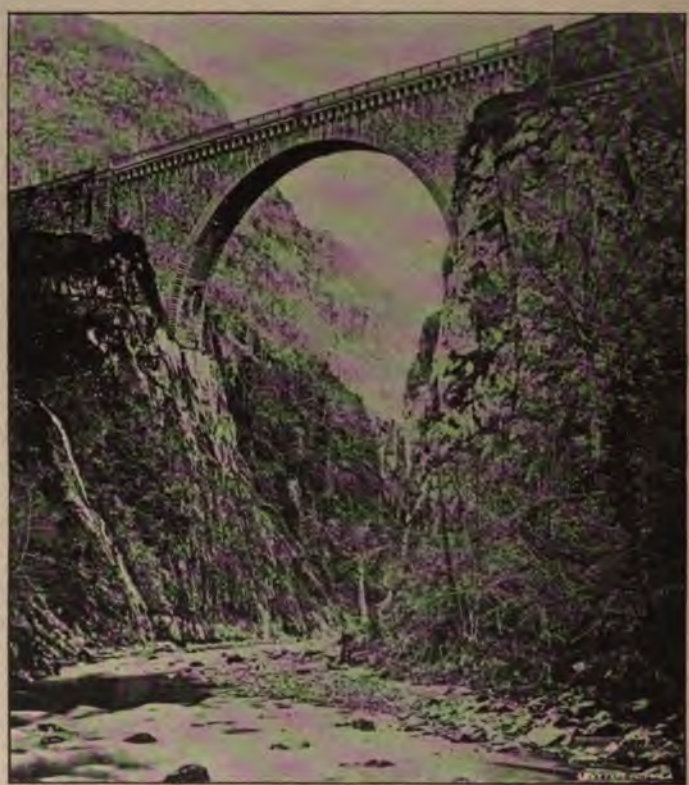


FIG. 21.—BRIDGE OF ST. SAUVEUR.

we see that those of the Middle Ages had often much steeper approaches, narrower roadways, and that the spans of the arches of the same bridge were very unequal. The shape of the arches remained, for the most part, as with the Romans, semi-circular or but slightly depressed, though sometimes pointed and sometimes segmental, and the piers were very thick and pointed. At the ends were frequently towers or chapels (Fig. 13), either for

purposes of defense or to commemorate the religious origin of the structure. While the workmanship was sometimes good, it was generally coarse and defective to such an extent that it is difficult to understand why some of them have stood until the present day. Some of them were remarkable for length of span, and for small thickness of the arch ring, as well as for small width.

In the sixteenth and seventeenth centuries many bridges were built, particularly in France and Italy. After the collapse of the old Pont Notre Dame in Paris, in 1498, the new structure, which still exists, was begun, and completed in 1507, and this was followed by the construction of several other stone bridges in Paris. The Pont Neuf was begun in 1578 and completed in 1604; the Pont St. Michel in 1617, the Pont Marie in 1635, the Pont au Change in 1639, and the Tournelle in 1656. These bridges still exist, although, to provide for the increase in traffic, the Pont St. Michel was rebuilt in 1859 and the Pont au Change in 1858, in each case the number of spans being reduced and the width increased. The Pont de la Tournelle was widened in 1845 by the addition of cast iron arches.

In Italy, the Trinity bridge at Florence (Fig. 14), built in 1570 by Ammanati, and the Rialto bridge over the Grand Canal at Venice, completed in 1590, belong to this period. The Trinity bridge has three nearly elliptical arches from 87 feet 7 inches to 95 feet 10 inches in span, and piers 26 feet 3 inches thick. The Rialto bridge, built in 1578 by Michael Angelo, has one segmental arch with a span of 96 feet 10 inches, and a rise of 20 feet 7 inches. The approaches are steep, with marble steps, and there are stores on each side of a central passageway.

At this time, it will be remembered, the use of very flat arches was considered a bold undertaking, and the Fleischbrücke (or Pont des Boucheries), in Nüremberg, built in 1599, by Peter Carl, consisting of a single arch with a span of 97 feet, and a rise of only 13 feet, or less than one-seventh of the span, was considered a very bold structure. The thickness of the keystone of this bridge was 4 feet; the abutments were built with joints in continuation of the arch, and were founded upon piles driven obliquely.

In the sixteenth and seventeenth centuries, then, the principal development appears to have been in the increasing use of elliptical, segmental, or other flattened curves instead of semi-circular arches, and in the increased care devoted to construction and to ornament. Worthy of note, too, is the improvement gradually being made in the foundations of bridges. The structures of earlier date had generally been founded on stone filling, and the piers had been necessarily thick, in order to distribute the load. The later bridges were founded upon pile platforms, or in caissons; while in the bridge over the Maas at Masstrecht, began in 1683 by the Dominican monk Romano, the first dredging machine is said to have been employed.

Fig. 15 shows the bridge of Allah-Verdi-Khan, at Ispahan, which has thirty-three arches of about 18 feet span, and three smaller arches at the end, all pointed, and of true Persian character.

Fig. 16 shows a bridge in China, which, in its steep approaches, reminds us of some of the mediæval bridges of Europe. The dates of these bridges are uncertain.

In the eighteenth century a great impetus was given to the rational and æsthetic design of bridges by the establishment (in 1716) in France of the Corps des Ponts et Chaussées, or government engineers of bridges and roads. Gabriel was placed at the head of the corps, being the first engineer-in-chief. Most of the bridges of the older period—those built by the Romans and by the "Brothers"—had tumbled down, and many new bridges were needed. From this time development was very rapid. After Gabriel's designs, the bridge of Blois, over the Loire, was built by Pitrou, in 1720, consisting of eleven flattened arches, with spans increasing from 55 feet at the ends, to 86 feet at the center, the grade of the approaches being as great as in many of the older bridges. In this bridge, for the first time since the old Roman days, the centers were supported entirely at the ends, without any intermediate supports whatever. In the bridge at Saumur, a saw was invented for cutting off piles under water at a considerable depth (16 feet), while in the Westminster Bridge, at London, built in 1738, by a French engineer, Labelye, caissons of the modern kind were used for the first time, being sunk upon a prepared foundation of piles covered by a platform.

In 1760 the Ecole des Ponts et Chaussées, originally started in 1747 as a drawing school, was organized for the training of engineers, and the noted engineer, Perronet, was placed at its head. From that time to this the great majority of the public works of France have been built by its graduates, and it is not too much to say that its establishment gave to France that preeminence in engineering which she enjoyed for so many years. Perronet's bridge at Neuilly, across the Seine, consisting of five spans of 128 feet, completed in 1774, and justly considered the masterpiece of its builder, was distinguished by the first use of what are known as cow-horns, the object of which is to facilitate the passage of floods and debris under the arches. Segmental arches, of course, owing to the fact that they are not vertical at the springings, but rise gradually, offer more obstruction to the floods than elliptical or basket-handle arches. For this reason, where used their springing had thus far generally been placed higher than when other forms were used, often much above ordinary high water. After the introduction of cow-horns, by Perronet, in the Neuilly bridge, however, segmental arches were soon used with the springing at the high watermark, or even below it. The use of cow-horns, moreover, gave an appearance of lightness, even though

the arch ring might be thicker than usual toward the abutments. The Neuilly Bridge was of the basket-handle type, with piers semi-circular at each end and 14 feet thick. It was founded on piles. Fig. 17 is the bridge at Bordeaux, with cow-horns.

The Pont de la Concorde, in Paris, begun 1787, has five flat segmental arches, with spans from 83 to 102 feet, supported by very slender piers only 10 feet thick, which would doubtless be unable to stand if one arch should fall. This small thickness facilitates the passage of the water, and gives the lower portion of the bridge an appearance of lightness which, however, is destroyed by the heavy treatment of the tops of the piers and the roadway.

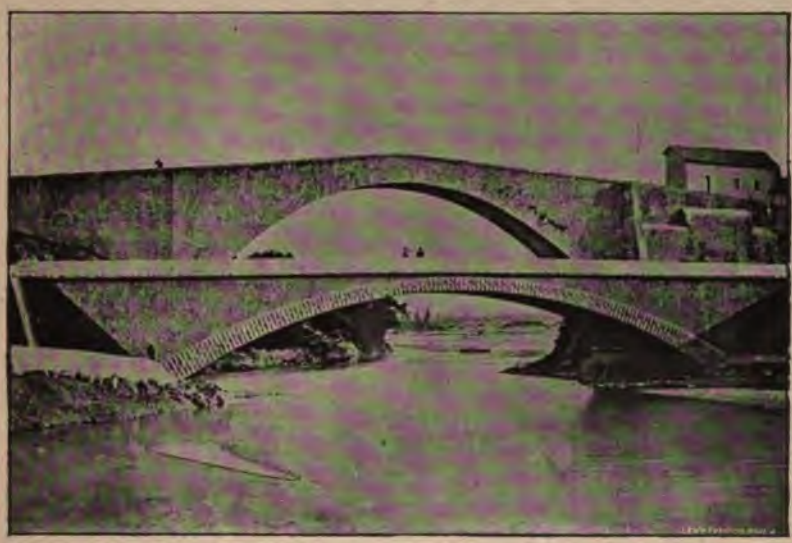


FIG. 22.—ANCIENT AND MODERN FRENCH BRIDGES.

To the eighteenth century belong some of the most noted stone bridges of England.

The old Westminster bridge, at London, completed in 1750, was the first bridge in which caissons were used in founding the piers. A settling of one pier, however, required the taking down and rebuilding of the two adjacent spans. This bridge had thirteen semi-circular arches with a maximum span of 72 feet. It stood for about a century, till the demands of traffic led to its being replaced by a cast-iron bridge of seven spans, 85 feet wide.

The old Blackfriars bridge, built by the Scotch engineer, Mylne, from 1760–1769, had nine basket-handle arches, with a maximum span of 100 feet and a rise of 40 feet. It was 995 feet long and 45 feet wide, and was handsomely decorated with double columns over the piers. The bridge cost

FIG. 23.—VIADUCT OF MORLAUX, FRANCE.

FIG. 24.—ROQUEFAVOUR AQUEDUCT, FRANCE.

£152,840. Owing to settling, however, and also, it is said, to the use of poor stone, it was necessary, in 1833, to repair the bridge at a cost of £105,138. Even then it was not satisfactory, and in 1865 it was replaced by a cast-iron arch bridge of five spans, designed by Joseph Cubitt.

The bridge across the Thames, at Kew, is still in existence, and though its dimensions are but moderate, it was carefully and solidly constructed.

Worthy of mention is the bridge over the Taaf, at Pony-y-Pridd, in Wales. In 1746 a mason, W. Edwards, built an arch bridge here of three spans. After two and a half years it was carried away by a freshet, and being guaranteed for seven years, Edwards had to rebuild it, and did so, using a single arch. It was completed, but the parapets had not been put on, when the load on the haunches threw up the crown and the arch fell. Mr. Edwards consulted Smeaton and rebuilt it as before, in 1748, but with openings in the haunches. The span is 140 feet, and the rise is 35 feet, and the thickness of arch ring at the crown 2.5 feet.

The aqueduct at Alcantara, near Lisbon (Fig. 18), is attributed by Gauthey to Trajan, but in reality the Romans made scarcely the beginning, and it was not until 1731 that the work was really begun. It had been nearly completed at the time of the terrible earthquake of 1775, which destroyed the greater part of the city. The aqueduct, however, was so solidly built that it was little injured, and, moreover, it was somewhat distant from the center of disturbance. This aqueduct contains thirty-five arches, the central or largest opening with a pointed arch of 100 feet span and 88 feet rise. The height of the intrados of this span at the crown is 197 feet above the river, and the maximum height of the structure is 230 feet. This is said to be the highest existing arch bridge having but one tier of arches.

The principal progress during the eighteenth century appears to have been in the increased use of the elliptical or other flattened arches, the reduction in the ratio of rise to span, the use of segmental arches with cow-horns, the gradually increasing length of span, the use of more slender and graceful piers, the reduction in thickness of the arch ring consequent upon a better knowledge of the mechanics of the arch, and the increased beauty of proportion and adornment. Progress, too, was made in the methods of foundation, by the use of caissons, dredges, mechanical pile drivers and saws for cutting off piles under water.

In the present century, and especially since the birth of the railroad in 1830, a great many stone bridges have been constructed, but the types have not changed, and the development has simply been in the directions just indicated.

Figs. 19–20 show some modern bridges. Fig. 19 is the Pont Neuf at

FIG. 25.—CABIN JOHN BRIDGE, NEAR WASHINGTON, D. C.

FIG. 26.—ECHO BRIDGE; SUDBURY AQUEDUCT, NEAR BOSTON, MASS.

Albi, in France, an extremely light and graceful structure. Fig. 20 is the Nydeck bridge at Berne, with a span of about 148 feet, a fine structure. Fig. 21 is the Pont St. Sauveur, in the Maritime Alps, with a span of 140 feet, and a height of 215 feet above the river. Fig. 22 is a view of two bridges, the older having steep approaches and a small width, to remedy which a modern bridge has been built alongside, nearly level, and of sufficient width for the increased traffic. Fig. 23 is the "Viduc de Moraux," and Fig. 24 is the famous Roquefavour aqueduct, in France, the highest stone bridge in the world.

These views show that there is no very great or essential difference between stone bridges of the present day and those of the Romans. There are differences in detail, with regard to the shape of the curve of the arch, the arrangement of the stones, the bonding, the proportions of the piers, etc., but the general principle and construction remain the same.

In America there are few large stone bridges. This is but natural in a new country. Not strange is it, either, that most of our large stone bridges are on works of water supply rather than on railroads. Our country has been built up by the railroads, which have penetrated in advance of civilization into new regions, and have been too poor at the beginning to build such costly structures—unlike the railroads of Europe, which were built through already rich and populous districts. Aqueducts, on the other hand, are built to supply already wealthy and populous cities, and the most durable and expensive structures are justified.

Of railroad bridges there are but very few large structures. The earliest was the Thomas viaduct, between Baltimore and Washington, over the Patapsco river, with eight elliptical arches on a curve. The spans are 58 feet, and the height above the river 65 feet.

The next is the Starucca viaduct, on the Erie road, in northern Pennsylvania, with eighteen arches of 50 feet span and 110 feet high.

A third is the Canton viaduct, on the Boston & Providence Road.

All of these, however, compared with the structures which have just been described, are unimportant works.

Of aqueducts, the first is High Bridge, over the Harlem river, in the old New York aqueduct, with seven spans of fifty feet and eight spans of 80 feet and eight spans of 10 feet, the height above the water being about 100 feet.

The second is the Cabin John Bridge (Fig. 25), over the creek of the same name, in the aqueduct supplying Washington. This was built by Gen. Meigs in 1866, and has one segmental span of 220 feet, with a rise of 57 feet 3 inches, being the largest stone arch span in existence, and only exceeded in the world's history in the case of the bridge at Trezzo, already mentioned. This bridge is but 20 feet wide.

The third is the Echo Bridge (Fig. 26), on the Sudbury river aqueduct, supplying Boston. This has a span of 127 feet and a rise of 42 feet.

(The lecture, of which this is a portion, was illustrated by a great many views, which space will not permit us to insert, showing most of the bridges referred to in the text, and many others not specifically described.)

WESTERN STONE COMPANY IN 1896.

THE annual meeting of the Western Stone Company was held January 20, in Chicago. President Martin B. Madden presented his report. It showed that while the company had suffered somewhat from the general stagnation of business it does not owe a dollar aside from its mortgaged debt. During the year the company has paid off $8,000 of bonds and $10,000 of mortgages and made a net profit of $59,609.87. President Madden's report is as follows:

In common with all other institutions, this company has suffered from the general stagnation in business during the year just closed. It was generally supposed that the volume of business for the year 1895, which was 21 per cent. less than that of 1894, could not well be reduced, but the fear of capital to seek investment was felt to a greater degree in 1896 than at any other period since 1873 to 1878. With the existence of such conditions, it is not surprising that the volume of business in 1896 has fallen 18.63 per cent. below that of 1895.

The strictest measures of economy, rigidly enforced, has enabled us to maintain the high standard which the company has always held in the commercial world. I am pleased to announce that the company does not owe a dollar aside from its bonded and mortgaged debt. That during the year we have not borrowed a dollar. That we have discounted every bill contracted. That we have paid off $8,000 of bonds and $10,000 of mortgages. That we have produced stone as economically as in 1895. That we have kept all our working machinery in first-class repair.

That we have concentrated our working forces so as to effect a saving of at least $40,000 in the management of the business for the coming year. The net profits for the year amount to $59,609.87. We have a net available surplus of $142,374.41, made up as follows:

Stone and supplies on hand	$ 88,270.61	
Bills and accounts on hand	61,824.58	
Unearned premiums	1,294.01	
Cash on hand	42,463.83	
Total		$193,853.03
From which should be deducted the current bills for December, amounting to		6,478.62
		$187,374.41
Deduct the dividend of 2 per cent		45,000.00
		$142,374.41

It gives me pleasure to say that each employe of the company has cheerfully cooperated with the management in an earnest endeavor to serve the best interests of the stockholders, and although the result of the year's work has been a disappointment to me, the best has been done that could be under the circumstances.

M. B. MADDEN.

STATEMENT FOR YEAR 1896.

Receipts.

From all sources		$523,158.44

Disbursements.

Labor and teaming	$255,869.74	
Rail and canal transportation	79,330.58	
Rents, interests and discounts	19,358.35	
Taxes and other expenses	76,669.90	
Interest on bonded debt	28,360.00	
Interest on mortgage debt	3,960.00	
Total		$463,548.49
Profit		59,609.87

Statement of Income Account.

Surplus January 1, 1896	$101,754.57	
Net earnings for the year 1896	59,609.87	
Total		$161,364.36
Deducting dividend paid January 13, 1896		67,500.00
Surplus January 1, 1897		$ 93,864.36

STATEMENT OF CONDITION JANUARY 1, 1897.

Resources.

Real estate and buildings	$2,218,698.63	
Tools and machinery	385,086.82	
Horses and wagons	27,092.80	
Office furniture	3,011.70	
Canal stock	92,600.00	
Stone merchandise and stripping	109,564.62	
Bills and accounts receivable	61,824.58	
Cash on hand	42,463.83	
Total		$2,940,342.98

Liabilities.

Capital stock	$2,250,000.00	
Bonded debt	534,000.00	
Mortgage debt	56,000.00	
Accounts payable	6,478.62	
Surplus	93,864.36	
Total		$2,940,342.98

The officers of the Western Stone Company are: President, M. B. Madden. Vice President, C. B. Kimbell; Treasurer, T. A. Heineman; Secretary, J. E. Lindquist.

ARCHITECTURE IN AMERICA.

WHEN the houses, churches and shops of our cities were first built they were built for use and not for ornament. We had few architects, and even those were without much perception of the beautiful and sublime; hence the mean aspect of many of their structuers. Within the last quarter of a century architecture has made great progress, and American architectural talent has been greatly developed. We perceive the change in the appearance of the towns and cities here and there all over the country.

There is still much to be desired; but a beginning has been made, and great advances are observable. The architect's object should be, if his genius be equal to his task, to so design a building as to give it an air either of sublimity or beauty. An air of sublimity, it is needless to say, cannot be obtained unless the structure be sufficiently large to induce it; massiveness (if not belittled by pettiness of ornamentation) and situation are the elements which impart it if the design be commensurate. Here in the design is the opportunity for the architect to immortalize himself, to live forever in his work. In the design "the poured-out spirit" should manifest itself. The architect may have the emotions that give rise to the idea of beauty, but a past master of the art tells us that "whatever is in architecture fair or beautiful is imitated from natural forms." This is illustrated by the gothic cathedral, and if the architect have the genius to give to the house of worship such imitation he should, in less degree, as befits size and situation, be able to give it to houses for domestic occupancy. One who was familiar with Philadelphia before the war, and who has seen it since, would upon revisiting it now be struck with its architectural improvement. There is now diversity where formerly was sameness; there is now architectural effect where formerly was utility alone. Stability, utility and often beauty are now combined in our private and public buildings, and many of our streets have an air of distinction. It is true that there are many of our new structures which do not do much credit to architecture, but as wealth accumulates greater demands will be made on the skill and taste of the architect and greater triumphs will mark the development of his art.

In a letter of his brother, written at the close of his lecturing tour in America, Matthew Arnold said: "Quebec is the most interesting thing by much that I have seen on this continent, and I think I would sooner be the poor priest in Quebec than a rich hog merchant in Chicago." A rich hog merchant may have a good time in a material way, even in Chicago; but doubtless a poet would feel more at home, although wearing the cassock of a poor priest, in the old City of Quebec. Which city the poor priest would prefer is another question. But Quebec does not owe its fascination to its architecture, whose chief distinction is its quaintness and its flavor of antiquity, but to its situation, to its people, to its everything. It was to Arnold the most interesting thing that he saw on this continent; and we fancy those of our readers who have seen it will agree with him.

Architecture can work wonders in all our cities. It can give them that air which a lover perceives in his mistress—a something which pleases his eye and satisfies his heart. And this love, this civic attachment, is a thing to be greatly desired; and whatever inspires it should be cultivated.—*Philadelphia Record.*

SETTING OUT A "BATTERED" ARCH.

SUBJECT illustrated herewith is an inclined, or battered, arch, whose face or elevation forms an acute angle with the axis of a cylinder. It becomes necessary for the proper construction of an arch of this kind to have the face of each arch stone cut to the proper angle to form that part of the arch to which it belongs, so that there will be a perfectly straight surface, and save extra work in trimming after the stones are in their respective positions, especially if the arch is a plane surface; but in a rock-face arch such defects as one stone lipping or projecting further out than another, can be more easily remedied by pitching with a chisel to suit the adjacent stone. The proper face lines can be got by measurement from the section, but as different men cut the stones—some being more careful and exact than others—there is always a difference than if one workman cut them all. But the truest and most sure way is to have a set of patterns for the joints and soffit. They will save much time and trouble in working and setting them.

Let Figure 1 represent the right section of the arch on base or ground line C D, the soffit line being A Y B. The top curve or extrados C O D, the joint lines 34, 12, 56, etc. The inclination or batter being shown at Fig. 2, O X M being the angle formed by the face and axis of the cylinder. The first work to be done, if the drawing received from the architect is too small a scale to work from, is to enlarge it—1½ is a good size but 3-inch is one that can be worked to a greater advantage. Draw an indefinite line R N from x with the radii x B and x D. Draw curves A Y B and C O D. Divide the arch into as many stones as required (in this seven) as A4, 42, 26, etc., and 34, 12, 56 will be the joint lines for half of the arch. At Fig. 2 make an angle equal to the batter as O X M, this being a section through X O of the elevation, X M being the base or distance through the wall, O X the inclined face, and P M the height or vertical face. The next to be done is to draw the plan. Draw 7, 8 parallel to C D. At 7, 8 erect a line equal to the depth of arch X M, as 7, 9, 8, 10. Connect 9, 10, and 7, 8, 9, 10 will be the outline of the plan. Drop from the elevation lines from A, 4, 2, 6, etc., in the soffit, and c, 3, 1, 5 from the extrados or top curve. Let the soffit lines be dotted, and the top black, as this plan is seen from the top. Draw across parallel to ground line from each of the joints as shown lines to touch

the section of the arch in the face O X, Fig. 2. From the points of contact drop lines to touch line 7, 8 prolonged. From 12 as a center with the several radaii describe arcs or quadrants to touch the line 12 T. From these points draw parallel lines to intersect the lines dropped from elevation. Draw curve through 9, 3, 1⁵, 0, and A′, 4, 2, 6, Y. The other side of plan can be transferred. Then 9A′, YB′, 1, 0, 7, 8 will be the plan of the arch. To find the development of the soffit parallel to 7, 8, at any distance from it draw line C D. At Fig. 3 make line E F equal to the stretch out of half of the soffit A to Y. Mark the points as shown. Drop lines from each. Draw a line parallel to E F, as G H. The distance E G equals 7 c′ in the plan. Carry the distances from the plan, as X 6, X 2, X 4 to Fig. 3 at X 0, X 0, etc., connect points 0 0 0 0 and these will be the patterns that will fit the soffit to give the proper pitch or cutting line.

To find the joint moulds: At Fig. 4 draw two lines parallel to each other equal to the width of the joints, as 1 2, 3 4, etc., in elevation. Draw lines from Fig. 3 to touch the line b c which will give the depth of the arch at the soffit point of the joints. For the top take distances from the plan, as 05, 01, 03, to a 5, a 1, and a 3, and these will be the joint or bed patterns; a b 5 Z will be the pattern for both joints of key and the top joint of the adjacent stone, and so on.

To cut the stones: Take W 0 2 on the left of the arch as a basis for all. At Fig. 5 is the assumed size of stone required, the length being taken from its longest point in the plan. Work one bed as A B C D, then with templet taken from the elevation as shown, apply straight blade to the bed at A B and C D and the curve to the soffit. Cut drafts at both ends and work soffit, though reverse the templet and cut the other bed. Then take the soffit development belonging to that stone and apply, and with each joint pattern mark on the cutting lines as shown at Fig. 6. By this method there can be no excuse for any cutter making a mistake. The top can be cut with No. 1. The stones can be cut by running the right section face pattern through and the patterns marked on after. Another way to get the sizes is to measure from a line drawn on the section at Fig. 7, as A B. Let the soffit and top lines of No. 2 stone be drawn on the section. Work the stone as shown in Fig. 5. At Fig. 8, which is the beds of No. 2, square a line on the beds as shown the same distances from the back as in the section. Carry the lengths X 1, X 2, X 3, X 4 from the section to Fig. 8 and mark as lettered. By this method no soffit or joint moulds are needed.

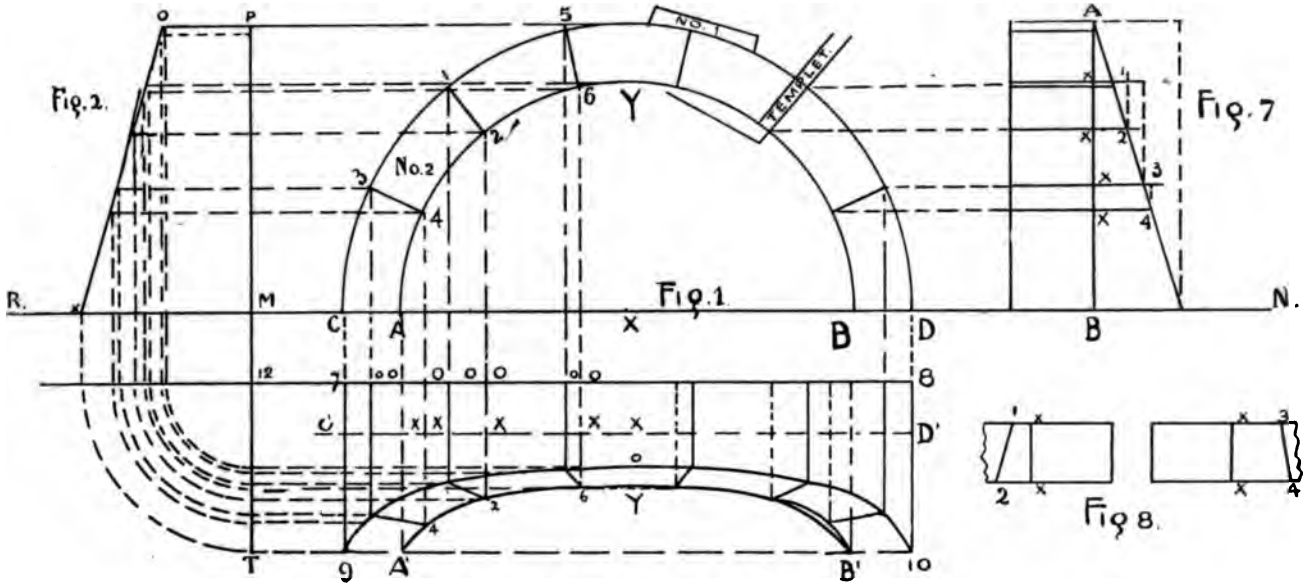


Fig.2.
Fig.1
Fig.7
Fig 8.
No.2
TEMPLET
Y
R.
N.
M
T
A
B
C
D
A'
B'

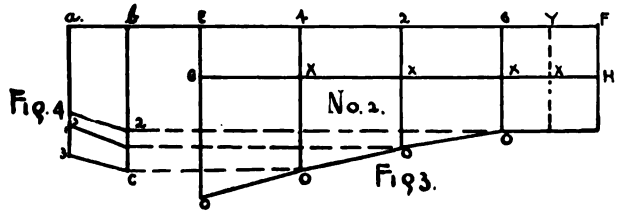
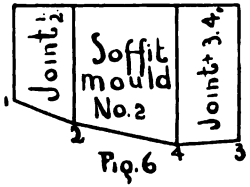


Fig.4
Fig.3
No.2.


Joint 1.2
Soffit mould No.2
Joint 3.4
Fig.6

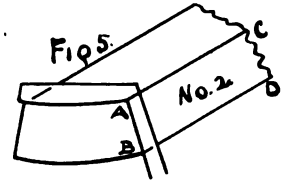


Fig.5.
No.2

*GEOLOGY FOR QUARRYMEN—II.

DEVELOPMENT OF FISSILITY IN HOMOGENEOUS ROCKS.

IF a rock be in such a position and under such conditions that it is deformed by regular fractures, it is probable that the secondary structures form in the shearing planes. Just as in the case of cleavage at any place in a rock mass the three principal stresses are usually unequal. In the zone of fracture if the differential stress surpasses the ultimate strength of the rock, fracture occurs along the two sets of shearing planes which incline toward the greatest stress and are parallel to the minimum stress. The maximum shearing stresses in the case of normal pressure are 45° from the greatest pressure and are at right angles to each other, but Hoskins shows that the fractures may incline at a smaller angle than this to the direction of greatest pressure, the latter bisecting the acute angle made by the intersecting ruptures. It is only in case the two lesser stresses are equal, or nearly so, that concoidal fractures are produced, such as occur in ordinary building-stone tests of cubes (fig. 128). In this experiment there is one direction of great stress and two directions at right angles to this of very subordinate equal stress.

Hence, in the zone of fracture, where the differential stress surpasses the ultimate strength of the rock, there may be produced a fissility in two sets of intersecting planes equally inclined to the greatest pressure. It is well known that a fissility in two directions occurs in many homogeneous rocks, and such structures have doubtless developed along the shearing planes under this law.

In case the direction of greatest normal pressure is nearly horizontal, the planes of fissility would be at angles of about 45° with the horizon. However, as no rocks are strictly homogeneous, and as the direction of greatest normal force is always compounded of thrust and gravity, the directions of the shearing may vary considerably.

In case the parting is very close, the rock is foliated. Each laminæ moves slightly over the adjacent laminæ. The rubbing of the laminæ over one another, due to the differential movement, gives the slickensided surface which are so common on both sides of the parted laminæ. The more intense the movement, the thinner and more brilliant do the folia become. Since the partings are usually inclined to the bedding, this structure may be called cross fissility.

*Reprinted from Sixteenth Annual Report U. S. Geological Survey.

In passing from the zone of fracture to the zone of flow it is to be expected that all gradations would be found between the development of cleavage in the normal planes and the development of fissility in the shearing planes.

Frequently fissility forms in lithologically homogeneous rocks in which the property of cleavage had already been developed, and which by subsequent denudation are brought so near the surface that the superincumbent weight is less than the strength of the rocks. When subjected to stress under these circumstances numerous fractures develop along the cleavage planes. This occurs because fractures take place so readily along these planes, and because the chances are always that there are shearing planes although they may not be those of maximum stress.

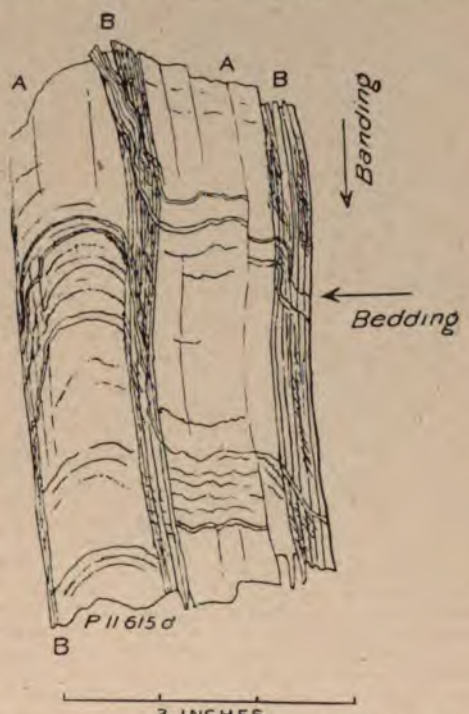


FIG 90.—Diagrams of specimen of shale, or phyllite, from near Rupert, Bennington County, Vt., showing the development of cleavage banding along the shanks of the plications, giving the rock the appearance of being stratified across the real bedding.

This may be the case although the direction and force of thrust may be varied. The direction of greatest normal pressure, combined of gravity and thrust, would be in a different direction when the rocks are in the deep-seated zone of flowage and when they are in the superficial zone of fracture. Thus, cleavage in the normal planes would pass into the shearing planes as denudation progressed.

In cases in which the fissility developes along a prior cleavage, the fissility parallel to these planes would be marked. The fracturing along the other set of diagonal shearing planes, not having the advantage of a previous cleavage, would be much less marked, the deformation perhaps largely occurring by considerable movements along a few planes of shearing. In this case the infrequent cracks may properly be called joints. In the planes of fissility secondary to cleavage the folia slip over one another just as in the case of originally developed fissility independent of cleavage, producing slickensided surfaces, and the rock developes a "fault slip" cleavage or "ausweichungs" cleavage (see figs. 90 and 91). In the majority of cases

in which the fissile laminæ are close together and have a uniform direction for a considerable area, it is probable that the structure first developed as true cleavage in the normal planes, and that a later movement, when the rock was nearer the surface, developed the fractures along the shearing planes. The structure is thus a product of the forces producing cleavage and those producing fissility working successively under different conditions.

As will be seen below, fissility may form in a manner similar to its development parallel to cleavage or parallel to planes of weakness of any kind, as, for instance bedding.

FIG. 91.—Microscopic section of part of cleavage band (central shaded one, marked B, in Fig. 90), enlarged 20 diameters, showing 360 slip cleavage planes to the inch, with ferruginous staining along them. Under higher powers this section resolves itself into a mass of muscovite scales and angular fragments of quartz, the flat sides of the scales usually conforming to the bedding planes At upper right hand the course of the bedding can still be made out.

The directions of the fissility are therefore dependent upon the direction of the forces, upon whether they are equal or unequal, upon the superincumbent load and the consequent friction, upon the cleavage and other previous structures, and upon previous folding.

If fissility develop along cleavage, as this structure is usually steeply inclined, the fissility will be in the same direction. That great thrust faults sometimes develop with nearly horizontal hades, or even parallel to bedding, is well known. Multiple minor thrust faults or fault slips producing fissility may similarly develop with flat hades, upon the same principles as cleavage in a like direction, and thus produce a fissility nearly or quite horizontal, or parallel to bedding. It is therefore clear that the structure may vary from a vertical to a horizontal attitude. There are therefore all gradations between cross fissility and parallel fissility, (fig. 133), just as between cross cleavage and parallel cleavage. In the case of parallel fissility the movement may be compared to the differential movements of a ream of paper which under load is pushed unequally forward from one end, the differential movement be-

FIG. 126.—Experimental production of fractures along the shearing planes. After Daubree.

tween any two successive sheets being the same. While the bottom sheet may be shoved one-tenth of an inch, the top sheet may be shoved 10 inches (see figs. 127 and 128 in Dec. STONE). Between the bottom and the top the amount of forward movement would vary regularly from one-tenth of an inch to 10 inches. While the differential movement between any two sheets is the same, each sheet gains all the forward movement of all the sheets below.

Where fissility develops, either as an original or secondary structure, rubbing usually occurs between the mineral particles along the sides of the laminæ. As a result, the minerals receive an elongation in the direction of greatest movement, a less elongation in the direction at right angles to this and in the plane

FIG. 133.—Parallel fissility on the limbs of the folds and cross fissility on the anticlines, and gradations between the two. After Heim.

The deformation is mainly by folding, but on the anticlines, where the material is partly relieved from stress, the deformation is partly by the multiple minor slips of fissility.

of movement, but are contracted at right angles to the plane of movement. Also new minerals which develop are controlled in the same manner. If the fissility be secondary to cleavage, the minerals were previously oriented with their two longer axes in the plane of differential movement, and the slipping of fissility but emphasizes an arrangement of the mineral particles which already existed.

Charles Richard Van Hise.

HOW LONG WILL THE STEEL FRAMES OF TALL BUILDINGS LAST?

WHAT is occurring or what will occur to the metallic portions of the many tall buildings that are in process of erection at the present time, under great dissimilarity as regards temperature, humidity and other climatic conditions, but of one characteristic sameness, viz: being sealed in solid masonry or other coverings beyond the ken of inspection? Probably no engineering question to-day is entitled to more serious consideration than this one. In discussing it recently before the American Society of Mechanical Engineers, Mr. M. P. Wood maintained that while inspection of some of the buildings now in progress as well as some of those lately erected, reveals possibly a slight improvement in the means of preservation adopted over those apparent a short time ago, yet the improvemet is a hollow mockery, and will bear fruit for repentance before many years have passed. These structures, though more carefully painted thanthose erected before, with more and heavier coatings of some kind of stuff called paint, do not appear in a single case to have received any attention or consideration as to the condition of the metallic surfaces before applying the protective coating beyond a possible sweep with a dirty broom to get rid of the rough dirt from the workshop yard, and a possible wipe with a piece of old sacking to remove the grease due to machining processes. There has been nothing like a washing down of the parts with soda ash or lye water to remove the grease, and then pickling with weak acid to remove the scale, and a subsequent washing with lime water to neutralize the acid bath, warming the work before painting it, and taking care to apply the paint on clear, bright days, when no sweating can occur, or applying the paint in warm paint rooms. It is safe to say that not in a single case out of the many skeleton structures of modern skyscrapers can this be found to have been the procedure. There would seem to be no better possible assurance than all this of trouble ahead for coming generations.—*From Cassier's Magazine for February.*

VALUE OF DIFFERENT KINDS OF STONE PRODUCED IN 1894 AND 1895.

LIMESTONE PRODUCT IN 1895.

THE following table shows the value of the limestone output for 1895:

Value of limestone production in 1895, with the uses to which the stone was applied.

State.	Lime.	Building and roadmaking.	Flux.	Total.
Alabama	$170,764	$26,319	$25,341	$222,424
Arizona	15,380	6,574	2,205	24,159
Arkansas	39,282	8,094	.....	47,376
California	244,580	77,631	.....	322,211
Colorado	8,646	24,363	83,346	116,355
Connecticut	125,000	29,333	.....	154,333
Florida	8,500	2,050	.....	10,550
Georgia	12,000	.....	.....	12,000
Idaho	7,216	613	.....	7,829
Illinois	164,785	1,482,425	40,452	1,687,662
Indiana	167,451	1,395,286	96,239	1,658,976
Iowa	114,205	324,136	11,160	449,501
Kansas	9,870	306,818	.....	316,688
Kentucky	37,108	113,418	3,604	154,130
Maine	600,000	100,000	.....	700,000
Maryland	150,000	50,000	.....	200,000
Massachusetts	61,300	20,000	.....	75,000
Michigan	70,589	350,000	4,000	424,589
Minnesota	29,895	188,838	.....	218,733
Missouri	210,376	659,787	27,155	897,318
Montana	20,121	.....	75,000	95,121
Nebraska	.....	7,376	.....	7,376
New Jersey	100,000	25,000	25,000	150,000
New Mexico	1,500	1,875	.....	3,375
New York	610,206	406,991	25,985	1,043,182
Ohio	613,575	668,124	287,014	1,568,713
Oregon	.....	970	.....	970
Pennsylvania	1,720,000	796,424	539,489	3,055,913
South Dakota	.....	4,000	.....	4,000
Tennessee	84,297	69,330	3,271	156,898
Texas	30,700	14,194	17,632	62,526
Utah	11,348	.....	11,155	22,503
Vermont	270,000	30,000	.....	300,000
Virginia	186,506	4,866	77,520	268,892
Washington	73,350	.....	2,560	75,910
West Virginia	25,922	5,413	11,557	42,892
Wisconsin	600,000	150,000	.....	750,000
Wyoming	650	.....	.....	650
Total	6,595,122	7,350,248	1,369,685	15,308,055

An inspection of this table shows a total value of $15,308,055 for the

entire limestone industry for 1895. The total for 1894 was $16,190,118. There has then been a decrease of $881,363. The value of the lime output for 1894 was $8,610,607 and for 1895 $6,595,122. The falling off in this item is nearly sufficient to account for the total decrease, but this has been offset by an increase of more than half a million in the limestone used for fluxing in 1895. Large quantities of limestone for flux were used in the smelting operations of Alabama, Colorado, Montana, Ohio, and Pennsylvania, while neighboring states also supplied stone in increased quantity for this purpose.

The value of lime made is slightly less than the value of stone used for building and roadmaking, while in 1894 it was greater than these two items. Roadmaking is annually making larger demands upon the limestone quarries.

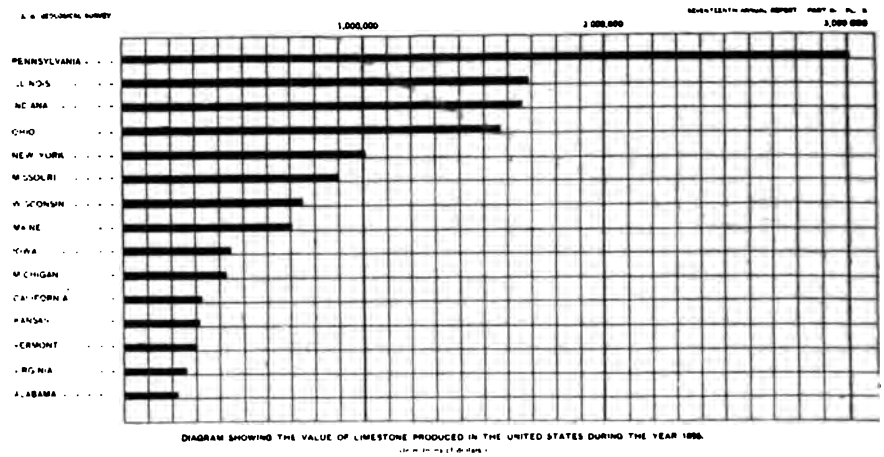


DIAGRAM SHOWING THE VALUE OF LIMESTONE PRODUCED IN THE UNITED STATES DURING THE YEAR 1895.

THE LIMESTONE INDUSTRY IN THE VARIOUS STATES.

Alabama.—Considering the general condition of trade, the limestone output of the state in 1895 is higher than might be reasonably expected. The output of 1894 amounted in value to $210,269, while that of 1895 reaches the figure $222,424. Of this figure $170,764 represents the value of lime made. In its production of good lime for building and other purposes the state is steadily acquiring a high standing in the South.

Arizona.—It is only within the last few years that limestone production has amounted to anything more than a very small figure. Since 1893, however, there has been a regular annual increase. In 1895 the product was valued at $24,159. More than one-half of this figure is the value of lime made.

Arkansas.—The output of this state in limestone is greater than ever

before. The value of the product in 1895 was $24,159; most of this represents the value of lime made.

California.—The value of the product in 1895 was $322,215; this figure includes the value of lime made, namely, $244,580. The remainder was used mainly for rough building and roadmaking. Dull trade is complained of, and a number of the smaller operators ceased quarrying for the year.

Colorado.—Most of the output of limestone in Colorado is used for fluxing and smelting gold and silver ores. The total value of the output was $116,355, of which $83,346 worth was for limestone used as flux. The output is a little behind that of 1894.

Connecticut.—In the burning of limestone to produce lime, Connecticut has done considerable in past years, particularly in 1894, when the value of the lime produced amounted to $204,414. All of the limestone output, with the exception of a very small portion, is burned into lime. In 1895 business seems to have been restricted to actual necessities, and the output is valued at $154,333. The vicinity of Canaan is the most important locality for lime burning.

Illinois.—Next to Pennsylvania, Illinois is the most important in value of output. The extensive quarries at Joliet and Lemont are by far the most productive. The stone is used mostly for building and street work, and it has an enviable reputation for these purposes. A large quantity is annually used in Chicago. The value of the output in 1895 fell quite considerably below that of 1894. The figures for 1894 and 1895 were respectively $2,555,952 and $1,687,662. The only reason apparent for the decline is the usual one—financial depression, which operated to lower the prices and to restrict output. Some of the larger operators report that the outlook for 1896 is much better. Incidental to the digging of the great Chicago drainage canal, enormous quantities of limestone have been blasted out by violent explosives, so that while the stone is too much shattered to be of value for building, it is nevertheless applicable to roadmaking, and it will all probably be used in time for this purpose. At present the stone removed in excavating the canal is piled in enormous heaps along the edges of the canal.

Indiana.—Much interest attaches to the limestone output of Indiana on account of the beauty of the oölitic stone for use in the finest buildings. The Bedford oölitic stone has a national reputation as an ornamental building stone, and it is also prized for its adaptability to ornamental carving and monumental work. In spite of hard times the output increased from a valuation of $1,203,108 in 1894 to $1,658,976 in 1895. In 1891 the output was valued at more than $2,000,000. The latter part of 1895 showed much improvement over the earlier part of the year, and for this reason the producers anticipate much better business in 1896. Slow collections marked the

course of business throughout the year. As was the case in many states, small producers in considerable number shut down altogether, but they will probably resume business again when conditions are more favorable. Prices declined somewhat, and this fact, of course, made it necessary to handle much larger quantities of stone to bring up the valuation to its present amount.

Iowa.—The value of the limestone output in Iowa fell off from $616,630 in 1894 to $449,501 in 1895. While this decrease is quite considerable, it is fully accounted for by the strained financial conditions which were apparently keenly felt throughout the state. The resources of Iowa in limestone are undoubtedly large and important, and as developments go on they will be more and more a feature in the annual products from the state. Some of this limestone quite closely approaches the crystalline condition eharacteristic of marble and, indeed, some of it is used for ornamental work as marble, and with good effect. About one-third of the output is burned into lime, but the prime importance of the stone lies in its adaptability for building and ornamental uses. The industry is widespread and the output comes from a large number of comparatively small producers rather than from a few operating upon a large scale, thus making the production of stone a matter of importance to the masses of the people.

Kansas.—Most of the output in Kansas is devoted to building purposes, and of that a considerable amount goes into bridge work. Quite an increase in output was realized in 1895, so that the entire yield was valued at $316,688.

Kentucky.—Some improvement in the industry is apparent for 1895, namely, from $113,934 in 1894 to $154,130 in 1895, but the total still falls somewhat below the output of former years. Much of the limestone of Kentucky is hydraulic. Kentucky oolite is well known for its beauty as a building and ornamental stone.

Maine.—The limestone of Maine is almost entirely burned into lime which enters quite largely into the markets of the more important cities on the Atlantic Coast, particularly New York. The output of 1895 was valued at $700,000, while that of 1894 was $810,089. In 1890 the output reached the figure $1,523,500, and in 1892 $1,600,000, but since the latter year production has decreased, perhaps on account of competition with Canadian lime.

Maryland.—After the publication of the report for 1894 it was found that a number of duplications of figures for output had occurred, making the total much higher than it should have been. The proper total for Maryland in 1894 is $350,000. Operations in 1895 were curtailed by reason of the general depression in business, so that the total for the year is $200,000.

Massachusetts.—Limestone production was at a low ebb during 1895. Production fell off from a valuation of $195,982 in 1894 to $75,000 in 1895. Abandonment of the business by large numbers is the reason for the decline.

Michigan.—Business improved very considerably in 1895. Producers complain, however, of slow collections for the entire year. Most of the product was used for building and roadmaking. Prospects for 1896 are good.

Minnesota.—The output fell off from $291,263 in 1894 to $218,733 in 1895. Most of the product is used for building.

Missouri.—A decided gain was made in the output of the extensive and commercially important quarries of this State. The valuation for 1894 was $578,802; for 1895 it was $897,318. Three-fourths of the product is used for building and road construction, and the remainder is burned into lime.

Montana.—The output of limestone in Montana increased from $92,970 in 1894 to $95,121 in 1895. Most of the product is used as flux in smelting operations, while the remainder is burned into lime.

New Jersey.—The value of the output in 1895 was $150,000. This amount is about the average annual output for the State. The usual complaints of poor business were made by many of the producers.

New York.—The limestone industry of New York State is one of much importance because of the wide range of uses made of the stone and the further fact that the stone is of fine quality for all these uses. The value of the total output in 1895 was $1,043,182. Of this total $610,206 is the value of lime made, while an amount valued at $406,991 was devoted to building and roadmaking. In the intelligent selection and application of stone to roadmaking few States are in advance of New York. The value of the limestone output in 1894 was $1,378,851. A decrease for 1895 is thus apparent, but it is hardly more than the present condition of finances would naturally produce. Operators speak encouragingly of the prospects for 1896.

Ohio.—The stone industry of Ohio is about equally divided between sandstone and limestone so far as the total value of the output is concerned. The limestone area is a wide one, and the industry is important to the masses of the people, since there is a large number of small concerns which in the aggregate foot up a large output. In addition to these are a few large concerns which annually contribute a considerable addition to the total for the State. The value of the product in 1895 was $1,568,713; the corresponding figure for 1894 was $1,733,477. A comparison of these figures shows a falling off in output, which is readily explained by the dullness of trade generally and the slowness of collections throughout the year. Some im-

provement is noted for the latter part of the year, and this leads naturally to the conclusion that 1896 will show material gains.

Pennsylvania.—The limestone industry of Pennsylvania is the result mainly of a very large number of small operators, although there are besides these a comparatively small number of producers operating upon a large scale. For the output of all kinds of stone the State stands first; there is, in fact, no kind of stone in commercial use which is not produced within its limits. In the production of slate it stands far in the lead of any other. While, with the exception of slate, there are no individual localities which stand out prominently for their stone output in the sense that makes Quincy, Mass., or Westerly, R. I., remarkable, it is at the same time true that there are a great many places at which a moderate amount of commercially valuable stone is produced regularly and uninterruptedly year after year. The hard times have, of course, affected all industries in Pennsylvania in much the same way as other States, but in spite of such conditions the value of the limestone output amounts in 1895 to $3,055,913. A little more than half of this is the value of lime, half a million dollars worth of which was used for blast-furnace flux, while the remainder is used for ordinary building and roadmaking. A large quantity of the lime made is used for agricultural purposes. Considerably more attention is being given at present to the improvement of roads than formerly, and this accounts for no small part of the increase in output for the past two years.

Tennessee.—The value of the limestone output for 1895 was $156,898. Somewhat more than half of this figure represents the value of lime made.

Texas.—The value of the limestone product in 1895 was $62,526. The output was greater than that of 1894.

Vermont.—Limestone production of 1895 did not come up to the total for 1894. In the last named year the output was valued at $408,810, while the total for 1895 amounted to $300,000. More than half of this value is that of the lime produced.

Virginia.—The product fell somewhat behind in 1895, being valued at $268,892; the difference, however, as will be seen by referring to the table of production, is not great.

Wisconsin.—The limestone output of this State is an important item. The annual product has been very steady for the past five years, and has ranged from $543,000 to $814,000. More than half the value of the entire product is the value of lime made. *William C. Day.*

"NIGGER HEADS," TURTLE STONES, ETC., EXPLAINED.

THESE concretions seem often like freaks of nature, as if nature liked to caricature in stone living things on the earth above. Thus we have had brought to us time and again fossil turtles and cocoanuts that were never turtles or cocoanuts, but, nevertheless, were as like them as two peas; fossil birds' nests, fossil corals that never were nests or corals, down to fossil dumb-bells, cups and saucers, tarts and tobacco pipes. These are generally found enveloped in sandstone, limestone, clay-beds or other sedimentary rocks and are usually of a material somewhat foreign to and heavier than that of the surrounding rock, such as iron balls or clay ironstones in beds of sandstone, lime balls in sandstone, or clay-Iron pyrite balls in coal seams, etc. Often these are not mere balls or spheres but take very grotesque and realistic shapes.

The concretionary principle, or the tendency to roll up in balls, seems to be among the fundamental laws of matter in one form or another in nature. Thus, our world is a big concretion of matter from the elements of space, and so down to the tiny little ball of iron in the rocks.

It would seem as if, when matter is in a loose incoherent state like sand or mud, if there be any other foreign element of a heavier nature diffused in this body, that it is attracted together into a concrete form, a ball or sphere. Thus in mud, iron in solution might run together into iron balls or clay-iron stone; or lime from decaying shells in the sandy bottom of the sea run together and collecting around a shell as a nucleus, form a big lime ball, such as we often discover in hunting for fossils in a sandstone bed. Or the nucleus may be a fern leaf, such as are familiar to coal miners, inclosed in flattened concretions in the roof of a coal seam. Fishes, insects, grains of sand, all sorts of things may act as a nucleus to arrest and gather around them certain kinds of matter.

Dana says of concentric structure: There is an aggregation of matter around a center making usually spheres or spheroids flattened by pressure. The form depends on growth by deposition from a solution around a center so that the growth is outward or centrifugal. It is generally growth by accretion producing a series of distinct concentric layers. Frequently a number of flattened concretions are united, forming a distinct layer, such as clay-iron stones; any sort of substance down to an almost invisible grain may act as a nucleus. Concretions often form as the first step in the pro-

cess of consolidation of a rock from a loose incoherent state like mud, and at first make a rock consisting of concretions which may disappear when the consolidation is complete. Beds on which filtrating waters spread with equal facility in all directions have spherical concretions; those of a laminated structure on which the waters spread laterally most easily, a spheroidal flattened kind. They are sometimes hollow rings or contain a ball within or a ball and socket structure. A rock full of minute concretions about the size of a pea is called pisolite or oolite, *i. e.*, pea or egg rock.

These are common among the old limestones of the world. We find them growing near coral reefs now, the coral mud gathering around a grain of sand as a nucleus.

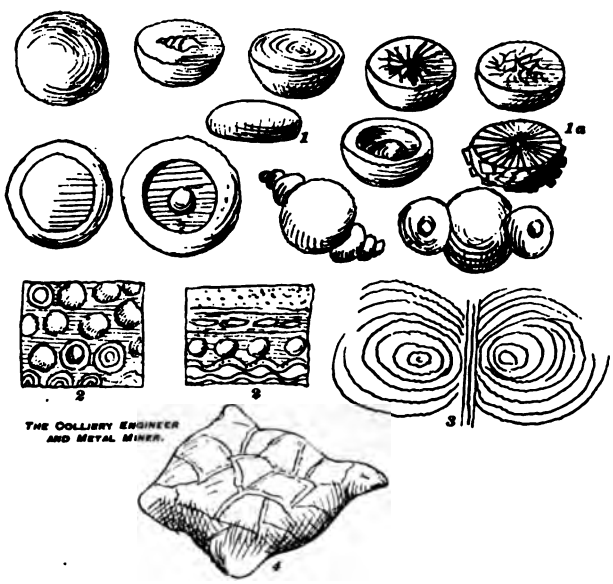


FIG. 1.—CONCRETIONARY STRUCTURES.

1, Different formns of Concretions. 1a, Iron Ball. 2, Pisolites or Oolites. 3, Concentric Coloration of Rock as at Cripple Creek. 4, "Mock Turtle" or Septaria.

Concretions may be of various matters—calcareous, iron pyrites, limestone and quartz. Nodules of flint in chalk cliffs are concretions of silica. The consolidation of a concretion is sometimes followed by drying from the outside inward. In this process the interior becomes cracked and the cracks may be afterward filled by calcite and make the illusion called "turtle stones," or petrified turtles.

Solidification from fusion may produce concretions in the mass, consisting of distinct concentric layers of different or of a single mineral. Pudding granite of Vermont contains large concretions of black mica. The same occurs at Balfour, Colorado. Concretions also grow radially from a center, with radiating porous columns within (*1a*, Fig. 1).

Balls, when hollow within and lined with crystals, are not concretions but "geodes." In the Iowa limestone, these have been supposed to occupy the centers of sponges previously hollowed out by siliceous solutions, like the hollowed corals of Florida, and then lined with crystals. Geodes are

common in veins of ore and cavities in volcanic rocks, and these are sometimes the results of steam bubbles. Concentric structure is produced by the consolidation progressing inward from the exterior—a centripetal process. Spheroidal masses of sand, colored deeply with iron oxide, are often hard outside, with loose sand within, or they have one or more concentric layers of rusty color within, or concentric shells of sand, and sometimes a loose ball. At Cripple Creek a concentric structure in the andesite breccia is beautifully marked by concentric rings of purple fluor stain and by gaudy rings of red and yellow iron oxide. (See 3. Fig. 1.) A concentric structure is produced also by decomposition along fracture planes, when these divide the rock into small portions; also by alternate heating and cooling.

The methods of consolidation of rocks are by calcareous waters, ferruginous waters and siliceous solutions. This consolidation is often commenced and accompanied by concretionary consolidation or accretion around centers throughout the mass. Isolated concretions form in deposits of earth, clay or other material when they contain disseminated calcareous, *i. e.*, lime grains derived from shells, etc. Percolating waters, aided by carbonic acid contained in such waters, dissolve the grain and deposit the material in a drying time around grains or any small object as a nucleus. So concretions of limonite (like those sent us) and iron carbonate are made if any iron grains or any decomposable iron-bearing mineral is present. The form of concretion is due to the regular process of the superficial accretion and rate of supply of the mineral solution in vertical and horizontal directions, together with the shapes of the nuclei. Near Fort Collins and also near Canyon City, Colorado, we have seen big sandstone ledges that look as if they had been bombarded by cannon shot and bombshells from big lime balls with fossil shell nuclei. Some of the balls are round, others pear-shaped, others flattened and others like dumb-bells. Some of these have rolled down the cliff and broken up like bombshells on a battle field.

The growth of concentric forms is peripheral, also a centripetal consolidation or from the exterior inward. It commences outside, owing to outside evaporations and deposition of the concreting agent. This agent is commonly iron rust. The process of out-side drying is shown by a drop of milk drying up on a spot of stone. Evaporation goes on on the outer margin, and makes there the first ring. Capillary attraction inside the ring contributes material toward it. The outer ring completed, another ring begins and forms at the new outer margin of the milk spot. So ring after ring forms till the spot of milk is reduced to a series of whitish rings. So on the same principle shell after shell may form in a sand bed penetrated with a rusty iron solution, because drying is gradual from the outside; or there may be a single outer shell with loose sand inside, or a central ball in the loose sand. The center of the concretion may have been a piece of the decomposing iron-

bearing mineral which afforded the rusty iron solution. The concentric rings of rusty coloration at Cripple Creek may have had this origin. In one case mentioned by Dana two sets of rings were observed on either side of a crack in the rock and had together a diameter of 20 feet.

Iron nodules forming beds of iron ore are of concretionary origin and were made by the concreting together of iron oxide from iron-bearing salts carried down into marshes.

Limestones also often contain iron carbonate, a gray ore, stonelike in appearance, but heavy in weight, it often occurs in nodules united into a layer.

The same limestone may contain nodules of limonite, another iron ore which affords a brownish yellow powder. This limonite has been made by oxidation of the iron carbonate. Limonite balls are common also in shale and may form beds beneath the fire-clay underlying a coal bed.—*Prof. Arthur Lakes, in the Colliery Engineer and Metal Miner.*

THE IOWA DEALERS.

THE Marble and Granite Dealers' Association of Iowa met in third annual session at Des Moines, Jan. 20. Mr. J. M. Graham, of Des Moines, is president, and Mr. G. J. Grueber, of Muscatine, is secretary, and with about fifty other gentlemen attended the meeting. The revision of the constitution and by-laws was the business of the session held in the afternoon and evening until 9 o'clock, when a banquet was served. At the latter Mr. Joe Kircher presided as toastmaster, being chairman of the committee on arrangements, of which Messrs. C. J. Field and T. A. Kaufmann are the other two members. Mr. Charles O'Donnell delivered an address of welcome to the granite men who sat at the banquet board, and speeches were made by several of the gentlemen on the accomplishments of the organization, its requirements and its integrity. The association will ask some legislation from the Assembly in the line of protecting the interests of the marble and granite dealers of the state.

These officers of the association for the coming year were elected: J. M. Graham, of Des Moines, was re-elected president, and G. J. Gruber, of Muscatine, was re-elected secretary and treasurer. It was decided that the next annual meeting should be held in Des Moines. There were several cities desirous of securing the meeting and Des Moines was decided upon only after a warm contest. The place of holding the mid-summer meeting is Clear Lake. The time of this meeting is not yet determined.

A considerable part of the day was devoted to a further consideration of the proposed lien law covering monuments. The old legislative committee was discharged and a new committee was selected. This committee is composed of E. Gaiser, of Knoxville, and J. M. Graham and Charles O'Donnell,

of Des Moines. The committee, it is expected, will put forth strenuous efforts to have a lien law enacted at the regular session of the General Assembly.

The members who attended the meeting just closed considered it the most successful convention in the history of the association. It was not only well attended, but it was marked by a far greater enthusiasm than ordinary. The amount of business transacted was unusually large. Formerly one day has sufficed for the transaction of all the business, but two entire days were required for this convention.

OUR FOREIGN TRADE IN STONES, ETC.

From the summary statement of the finance, commerce and immigration of the United States, corrected to January 6, 1897, we compile the following:

ARTICLES.	NOVEMBER.				11 MONTHS ENDING NOVEMBER			
	1895		1896		1895		1896	
Imports—	Quan.	Values.	Quan.	Values.	Quan.	values.	Quan.	Values.
		Dollars		*Dollars*		*Dollars*		*Dollars.*
Cement, Rom., Portland & other hydraulic...lbs	130,305,898	421,507	69,681,848	221,772	1,114,829,972	3,610,542	1,011,284,048	3,209,152
Cement, imp. from (lbs.)								
United Kingdom	59,576,630	191,695	19,021,147	61,591	291,731,491	915,049	243,816,015	789,739
Belgium	23,765,905	74,100	17,078,300	49,663	261,426,255	804,953	261 632.778	761.916
France	352,800	1,080	1,366,620	4,022	8.663.096	26,630	18,211,973	50,8 2
Germany	43,275,202	141,658	31,109,815	102,117	490,769,651	1,642,473	461,042,129	1,518,513
Other Europe	3,050,780	11,641	970,366	3,679	55,488,177	195,469	21,672,453	76,211
British North America	284,581	1,333	135,600	700	4,129,061	18,602	3,687,100	15.689
Other countries					2,622,240	7,366	1,221,000	5,652
Total	130,305,898	421,507	69,681,848	221,772	1,114,829,972	3,610.542	1,011,284,048	3,209,152
Marble, and mfrs. of		77,614		50,769		781,118		767,545
Stone, & manufactures of, including slate		27,486		26,356		372,150		364,224
Total		105,100		77,125		1,153,268		1,131,769
Exports—								
Marble and stone, and manufactures of:								
Unmanufactured		7,846		7,764		68,279		65,807
Manufactures of—								
Roofing slate		11,219		67,661		68,172		443,199
All other		52,984		41,619		762,120		528 170
Total		72,047		117,044		898,571		1,036,176
Cement.....bbls			1,873	3,812			50,163	79,494
Exports foreign mdse								
Cement, Rom., Portland & other hydraulic...lbs	509,837	1,749	215,208	695	3,288,255	12,681	4,178,198	15,584
Marble, & mfrs. of		4		42		959		3,005
Stone, & mfrs of including slate		596		884		4,035		9,501
Total		540		926				12,506

Merchandise Remaining in Warehouse on November 31, 1895 and 1896, Respectively.

ARTICLES.	November 30—			
	1895.		1896.	
	Quantities.	Values.	Quantities.	Values.
Cement, Roman, Portland, etc.....lbs...	9,554,766	$ 32,092	14,355,568	$ 42,091
Marble and stone, and manufactures of:				
Marble, and manufactures of		62,784		33,102
Stone, and manufactures of, including slate		54		773
Total	9 554,756	$ 94,930	14,355,568	$75,966

[Regular Correspondence STONE.]

NOTES FROM ABERDEEN.

We have competitive schemes for light railways from Aberdeen. The first, from Aberdeen to Echt, promoted by a private syndicate, will cost £108,571. The other—Aberdeen and district—put forward by the Great North of Scotland Railway Co., will cost £60,000. The line goes in the same direction as the other, and would it is proposed be worked in conjunction with the city tramways and with a new circular suburban railway. The Great North's complete scheme will cost about £160,000. The Light Railway Commissioners have to hear and decide on the applications.

The city surveyor of Aberdeen proposes a new sewerage scheme, to cost £160,000. The present sewers were designed thirty years ago, since which time the population has doubled and the police and municipal area has increased five-fold. The wasting sewerage system has thus become insufficient.

Messrs. A. Macdonald & Co., Limited, the only limited liability company in the granite trade in this quarter, are to redeem a fourth of the capital. The amount required to pay for the goodwill of the works—the Aberdeen Granite Works, the earliest monumental works in the world—has been accumulated out of profits, and the capital is not required for the business. The shares will now be 16 shillings (12s. paid.) This financial operation has strengthened stock exchange quotations for the shares.

A scheme is on foot to erect at Aberdeen sea-beach a marine laboratory and aquarium at a cost of £3,000, the scientific direction to be undertaken by the University of Aberdeen.

As the weather continues open, a large amount of building is going on in this city. The building boom will in fact be more marked this year than ever. Quarries are accordingly busy. The American branch of the monumental trade is in a state of hibernation; otherwise it is fairly good.

During 1896, 124 lives were lost by accidents in quarries in the United Kingdom, an increase of 22 on the previous year's record. *Heatherblow.*

THE QUARRIER'S NATIONAL UNION.

To the Editor of STONE:

DEAR SIR:—In reading January number of STONE, we were greatly amazed to read our epitaph in your article entitled, "Is There Trouble Ahead?" We are pleased to tell you and the readers of your valuable magazine, that the Quarrymen's National Union is in a healthy condition, with headquarters at West Dummerston, Vt., and is not practically defunct or positively dead as your article would infer. Furthermore, we are not confined to the New England States, but have active branches from Maine to Oregon, and from Vermont to Texas. As a conservative trades union affiliated with the American Federation of Labor, understanding the industrial condition of the country during the past three years, we have avoided friction with the employer wherever possible. With a motto of "Honesty, Industry and Sobriety," we are endeavoring to raise ourselves, financially, socially, and morally. The word defiance is unknown to us as a trades union, but you will find our Defense written with a big D. We are organized to defend

our trade from the $1,00 per day immigrant and the dishonest "one horse" contractor. Hundreds of quarrymen are defrauded of their hard-earned wages every year and it is to combat the above-mentioned enemies of American institutions that quarrymen are enrolled in the front ranks of organized labor.

We are in hearty sympathy with the honest employe who pays living wages to his quarrymen, believing that which is his interest is our own. We are not an aggressive organization but stand ready at all times to protect our members from injustice, and can truthfully state that in the seven years of our existence as a union, not a single member has ever been found guilty of an unlawful act during any trouble that has been forced upon us. Trusting that you will give this article as much publicity as you did our epitaph, we remain Very respectfully yours.

WM. O'DONNELL, N. U. Prest.

West Dummerston, Vt. Jan. 29, 1897. P. F. MCCARTHY. N. U. Sec.

PROTECTIVE SPECTACLES FOR WORKMEN.

INJURY to the eyes by dust, sparks, flying splinters and stones is by no means rare, and only imperfectly prevented by the ordinary spectacles. These are made either of wire gauze, and are then so dark that the men cannot help taking them off occasionally, or of glass. The latter are not liked. A cold draught makes them dim, and the grimy hands are not suited for cleaning them. They are destroyed by heavy blows, moreover, and themselves give dangerous splinters, and the side frames have to be pressed close against the cheeks, so that ventilation is stopped, and the men complain about hot eyes. Dr. Thomalla, of one of the Berlin accident wards, has devised a spectacle made of Schering's gelatoid, an elastic perfectly transparent material, which can be hardened in amylacetate. If really broken by flying pieces the mass does not splinter. Ventilation is effected through oblique perforations, through which under exceptionally unlucky circumstances only a splinter or dust particle might find its way. The gelatoid does not condense moisture on its surface, and does not become so hot as glass near an open fire. It does not catch fire.

The Mexican Boundary. Two hundred and fifty-eight stone and iron monuments now mark the boundary line between the United States and Mexico, from the mouth of the Rio-Grande to the Pacific ocean, seven hundred miles. The larger number of the monuments are of cast iron, but the principal ones are of stone. They average two and one-half miles apart, but in no case is there an interval of as much as five miles between them. Stone is used whenever possible. Generally they are simple tapering, four-sided shafts, bearing suitable inscriptions in English and Spanish.

The stone monuments are about eleven feet high, and those of iron about six and one-half. They are so arranged that they are in sight of one another from one end of the line to the other. The country traversed consists largely of so-called deserts, and mountains, and in many instances the work was prosecuted in the face of many dangers and difficulties.

By terms of the treaty the destruction, displacement or removal of any of these monuments is made a misdemeanor, punishable according to the law of the country of the offender's nationality. An extensive report of the commission that did the work, covering seven-hundred pages of printed matter, and accompanied by maps and photographic views, was submitted recently to Secretary Olney by Col. J. W. Barlow, corps of engineers, U. S. Army.

The line was formerly marked by about fifty monuments, erected under the terms of a treaty entered into between the United States and Mexico, dated City of Mexico, December 30, 1853. The re-survey and re-making of the boundary was rendered necessary in order to put an end to the constant disputes and controversies over territorial rights resulting from their destruction or displacement.

The report recalls that of Maj. William H. Emory, who was the commissioner appointed by the United States to co-operate with the Mexican commissioner, Don José Salazar Y. Larregui, which was submitted to the Secretary of the Interior July 26, 1856.

The preliminary part of this report is interesting because it shows up the political conception, wire pulling, jealousy and incapacity of many who were appointed to office in "the good old times" of which we have heard so much. We wish to urge every student to read Maj. Emory's report if they wish to get a glimpse of official life of the past; not only this report but many another government publication will yield many grains of golden truth to the patient delver into their truths.

Organized Labor at Lettings. When organized labor lifts its brawny hands at lettings for public buildings there comes a pause in the proceedings. A partisan board has deferential respect for any organization that controls votes. The bidder, therefore, who is under the ban of the unions

must put up a marvelous fight to win a contract for a public building that is let by a board of political appointees. Of course it is no excuse for any public functionary to not do his duty toward all the people, because his action may receive the disproval of a body of men whose selfish interests are involved, nevertheless boards of political appointees do that invariably when the unions demand it. Take the case of the Georgia granite producers in the Detroit court-house letting as an illustration. They were ruled out of competition for the granite that is to go into that structure because they are at war with organized labor.

It is possible that the people of Wayne county would have saved money by adopting Georgia granite, and got as good material as they will get, but what is that to the policy of placating the Federation of Labor even if the good citizens who compose that body are generally small taxpayers or no payers of tax at all! They are voters. If this sort of business could be made to work both ways, probably it wouldn't matter so much, but it is not on record anywhere that we know of, when a board disbarred a bidder who was backed by the unions, because he was so supported.

A Sample of Honest Stone Construction. That "rotten old ruin," the Chicago Federal building, is about the toughest job the wreckers have tackled since they have been in the business. The daily papers that so unmercifully criticised its construction, slandered its builders, and repeated the lie that the material of which it was built was "puddin' stone," or worse, we notice have not a word to say in defense of their statements while the dismantling proceeds and the character of the construction is revealed. As a matter of fact that building was honestly put up—every part of the stonework shows it. No fault is disclosed in the superstructure, and none in the material used for the foundation. The "wrenching" visible in its last days, came from causes lying below the stone foundation—from the fickle soil imperfectly prepared to sustain the great weight. It must be remembered the foundations of this building were put in before architects and builders adopted the present form. There's manifest no defect in any other portion of the work. The stone from that building is as durable to-day as it was twenty years ago, and it was laid "for keeps." Much of it is going into fine structures that are designed to last for scores of years. It is a serious question if the foundations of the "ruin" can be taken out without blasting.

Lien Law on Monuments. A law in New York giving a lien on a tombstone for the purchase money has been declared unconstitutional by the Supreme Court of that state. The court in its decision says:

> The act in question is almost without precedent in the legislative history of the state. It confers upon the lieners the right to go upon the plaintiff's burying grounds and dig up and remove the monument and sell it at public auction without the consent of the owner. In removing the monument they may desecrate the graves and disturb the remains. * * * Every civilized country regards the resting place of the dead as hallowed ground, and not subject to liens and to be sold upon execution like ordinary property. Courts of equity have always been ready to restrain those who threaten to desecrate the graves of the dead and to protect the sentiment of natural affection which the surviving kindred and friends entertain for their departed relatives.

With due respect to the honorable Supreme Court of New York, its decision in this case may be in exact accordance

with law and precedent, but nevertheless it is rank injustice to the monument dealer. By it the courts say one may not regain possession of his own property; that one is an "owner" who has not received a clear title to the thing he possesses.

It does not follow that the removal of a monument from a cemetery lot would "disturb the remains" any more than the "remains" were disturbed in placing it there, and it is pretty weak reasoning that sets up that proposition as a legal rule. Courts are established and maintained to enforce justice and equity among men. Would it be considered "desecration" for them to interpose to save the living from disgracing the dead? And isn't it desecration of the resting place of the dead to mark it with an unpaid-for monument? What sort of "natural affection" is that that will put on "hallowed ground" an indestructible monument to its own perfidy—one bearing, perhaps, the inscription, "requiescat in pace," while constables scurry around trying to collect the price of it from the tender-hearted living scamp.

Let's look at business transactions with business sense. The artist who paints a portrait of one who is dead may attach it for the price the living agreed to pay for it. The sculptor may proceed in the same way for the bust he wrought. These are like unto the cemetery monument a "sentiment of natural affection which the surviving kindred entertain for their departed relatives." Why draw a sacred circle about the grave and not about the home?

There appears no prospect of monument dealers securing legislation that will stand against the morbid sentimentality of courts that reason on the lines set forth in the New York decision. Their sole recourse is to demand payment for their work before it is executed or set up. While such terms are difficult to exact, and while a sale may be disputed on a score of technicalities, they can at least keep possession of the property until it is paid for.

The Tyranny of Strikers. Several months ago we noted the case of a city in the Northwest that had adopted the plan of providing work for the needy poor in quarrying stone for road building, and the revolt of organized labor against the employment of these needy poor at the wages the city could pay during the emergency. We have to chronicle now a somewhat similar action on the part of men engaged to work in a quarry at Canton, O. The township trustees have been giving as much work to the needy as it was possible to provide at a scale of wages that was possible to pay from the fund devoted to that purpose. This time all the needy poor except five struck for better wages and shorter hours, and when the five refused to go out the majority resorted to intimidation to drive them away from their jobs. They succeeded. The result was the trustees closed the quarry and decided that the strikers be left to shift for themselves, with the charity fund closed against them. This is a deplorable case, as much so for the unreasonable selfishness and brutal conduct of men who are unwilling, though suffering, to accept any remedy, but must add to the intensity of want the resultant of greater misery to themselves and to those they hate for being more manly than themselves.

This Canton incident was not a strike of organized labor, we are glad to note, but it was a rebellion of brutal men, who having been fed wotted not of the travail of hunger that would come upon the innocent because of their act.

The Emigration Eastward. We observe no more hopeful sign of returning prosperity—no more encouraging indication that the craze for "booming" is dying out—than the setting-in of a tide of emigration from the West to the East. In this hegira, if settlers do not repeat the folly of foreign immigrants by locating in the crowded cities of the East, but will take up the waste farming and stock-raising lands and go at the same work they came to the West ostensibly to do, it will be well. Land is almost as cheap to put under cultivation in the states east of Ohio as west of the Mississippi, but of course not so productive. But then to make a decent living fewer acres will be required, the meteorological conditions are more stable, the markets are closer at hand, the highways more easily traversed, the cost of articles they may exchange their own products for are not so high-priced, the requirements of an older social organization will be met, and though they will not have as many acres, nor as large harvests as the husbandmen of the far West, we opine they will be happier and better contented, in that they will be freed of the cruelties of the usurer, the baneful influence of Populism, and the degeneracy of frontier life.

Not only are the farmers of the trans-Missouri section looking toward the East as their future home, but the speculative professional man, the merchant, and the mechanic who have helped in the building of the Wichitas of that West, from the headwaters of the Mississippi to those of the Rio Grande, are "pulling up stakes" and going back to the region from whence they migrated during the boom times of a dozen years ago. This will help those who stay, and it will put a more active spirit into the towns and cities of the East that have suffered because none but old fogies have been running things for many years. Go east, young man, go East!

The New Tariff. The incoming administration will probably take up the revision of the present tariff schedule as the first act toward encouraging a return of business prosperity. A hearing was granted early last month to marble and granite representatives by the ways and means committee. These products are most affected by tariff—building stone being practically without hurtful competition with foreign material. The marble and granite men were not at all diffident in asking for an increase of one-hundred per cent. and more over the existing rate, and a substantial increase over the McKinley rate. And their point should carry. If there are any products more unessential as imports to this country than marble and granite the tariff schedule doesn't name them. We wish the tariff against them could be prohibitive, but, of course, it cannot be, because Italian marble and Scotch granite will be imported in no inconsiderable quantities no matter what they would cost, for such is the predilection of our snobocrats for the foreign brand. An increase of duty will give us exclusive control of this market for the cheaper grades of marble and granite and at the same time adequate protection on the higher grades now almost profitless because of the difference in cost of quarrying and manufacturing. The makers of the new tariff should bear in mind the indisputable fact that there are only a few grades of foreign marble and granite that excel in natural quality what we are competent to produce here, while here there are in abundance numerous grades, found nowhere else in the world, which are comparable with anything the old world has ever known.

SELECTED MISCELLANY.

COLOSSAL STATUES.

AMONG the colossal statues of Greece, the most celebrated was the bronze colossus at Rhodes, dedicated to the sun, which was commenced by Charles of Lindus, a pupil of Lysippus, and terminated at the expiration of twelve years by Laches, of the same place, at a cost of 300 talents. It height was 90 feet according to Hyginus, 70 cubits according to Pliny, or 105 according to Festus. It was thrown down by an earthquake fifty-six years after its erection. Another Greek colossus, the work of Calamis, which cost 500 talents and was 20 cubits high, dedicated to Apollo, in the city of Apollonia, was transferred from thence to the capital by M. Lucullus. Some fragments in marble, supposed to have belonged to this statue, are still preserved in the Museo Capitolino. There were two colossal statues in bronze, in Greek workmanship, at Tarentum; one of Jupiter—the other and lesser one of Hercules, by Lysippus, which was transplanted to the capitol by Fabius Maximus. Among the works of this description made expressly by or for the Romans, those most frequently alluded to are the following:—1. A statue of Jupiter upon the capitol, made by order of Sp. Carvilius, from the armor of the Samnites, which was so large that it could be seen from the Alban mount. 2. A bronze statue of Apollo at the Palatine library, to which the bronze head now preserved in the capitol probably belonged. 3. A bronze statue of Augustus, in the forum, which bore his name. 4. The colossus of Nero, which was executed by Zenodorus in marble, and therefore quoted by Pliny in proof that the art of casting metal was then lost. Its height was 110 or 120 feet. It was originally placed in the vestibule of the domus aurea at the bottom of the Via Sacra, where the basement upon which it stood is still to be seen, and from it the contiguous amphitheater is supposed to have gained the name of "Colosseum." Twenty-four elephants were employed by Hadrian to remove it, when he was about to build the temple of Rome. Having suffered in the fire which destroyed the golden house, it was repaired by Vespasian, and by him converted into a statue of the sun. 5. An equestrian statue of Domitian, of bronze gilt, which was placed in the center of the forum.

POPE ON GOOD ROADS.

IN one of his famous speeches on good roads and the improvements of city streets, Colonel Albert A. Pope, president of the Pope Manufacturing Company of Hartford, Conn., stated the following interesting facts:

"As a result of elaborate experiment, made to ascertain the relative resistance or friction of different pavements, it has been established that while 200 pounds' force is required to draw one ton over an ordinary dirt road, 100 pounds will do the same work on macadam, 33 pounds on best granite blocks, and 15 pounds on asphalt. As a particular instance of this, it is estimated that in the city of New York there are 12,000 trucks, carrying an average load of 1½ tons, for twelve miles on each of 300 days in the year at an average daily cost of $4 for each truck. The result is about 65,000,000 tons transported one mile in every year at a total cost of $14,000,000, or at the rate of over 22 cents per ton-mile. The excessive nature of this charge is seen when it is remembered that the same goods are now carried by rail at 6-10ths of 1 cent per mile. On asphalt road pavements the same horses could transport a load three times as heavy as on the present rough stone pavements. If a saving in transportation is proportional to the load carried, it would

amount to nearly $10,000,000, per annum. It is safe to say that at least one-half this amount could be saved by substituting smooth pavements for those now in use in New York; and in any city where the pavements are on an average poorer and rougher than those in New York, it is clear that the proportionate saving by the introduction of the best street surface will be even greater. Good roads are comparatively cheaper to maintain and to use than poor ones."

THE COXEY QUARRY TROUBLE.

LOUIS ECKERT, a quarryman discharged by the manager of J. S. Coxey's stone quarry, Massillon, O., because of alleged leadership of the short-lived strike, sends the following card, which he desires published: "The stone quarrymen's union was organized June 3, 1896. It was organized to carry out the suggestion of Mr. Bell, who is Mr. Coxey's superintendent, who said if we would organize a union we would soon be getting as much for eight hours' work as we did for ten. An item in the paper stated that Charles Martin, Louis Eckert and William Eninger were ring leaders in the strike. Now these men were only appointed a committee, on a Monday night, to state that there would be no more work until all were paid. The others said that they would stand by us. Instead of doing so they went back on the agreement and returned to work, while their committee are made to bear the responsibility of being leaders."

STEEL AND CORUNDUM COMPARED.

RESISTANCE under pressure of steel and stone was recently made the subject of experiments in Vienna. Small cubes, measuring one centimeter, of corundum and of the finest steel, were subjected to the test. The corundum broke under the weight of six tons, but the steel resisted up to forty-two tons. The steel split up with a noise like the report of a gun, breaking into powder and sending sparks in every direction. which pierced the machine as shot would do.

THE COMMERCIAL GEOGRAPHY OF EUROPE.

WE need only read our consular reports to be convinced that geography is really the basis of commerce. Our consuls are constantly telling American merchants that they hold a subordinate place in the trade of most of the Latin-American republics, for instance, because they do not study those countries as German and English traders do; because they are ignorant of these various regions and their resources, of the people and their peculiar ways and tastes, of their languages and their special wants.

How profoundly is commerce affected by geographical discovery! For 2,000 years the land-lock sea between Europe and Africa was Europe's great highway of trade. The Phenicians were at that time the most adventuresome seamen and enterprising traders, their boats skirting every shore and inlet of th Mediterranean; and later, Venice rose out of the lagoons near the head of the Adriatic and her people became the great carriers and distributors of the time. In the fourteenth century Venice was the home port for 3,000 merchant vessels. It was a fortunate thing for the little British Isles when the western world was revealed, four centuries ago, and the Atlantic instead of the Mediterranean became the highway of trade; and it needed only Da Gama's voyage to India by the new-found route around the Cape of Good Hope to complete at last the commercial decadence of the Mediterranean. Every port on the long coasts of that inland sea languished for centuries, until the Suez Canal made Africa an island and opened a far shorter route to the Orient. The Mediterranean has

again become an important highway and Marseilles, Genoa, and many other ports have felt the impulse and once more are important commercial factors.

Explorers have simply brought to us a practical knowledge of the world's geography; but some nations have not known how to turn this knowledge to good account, and that is the reason why Spain and Portugal, preëminent in geographical discovery as they were, fell hopelessly in the rear of their sister countries which had more wisdom, enterprise, and commercial spirit. Bad management or legislation may offset the greatest commercial advantages, impoverish a people, or keep a nation poor.—Cyrus C. Adams, in *The Chautauquan* for February.

TOUCHING RURAL OBITUARY.

"YOU might put on thar," said the bereaved husband to the rural sculptor, "that she died peaceful, an' that we wouldn't call her back."

"Anything else?"

"She never spoke a cross word in her life."

"All right."

"Bein' deef and dumb an' of a quiet an' retirin' natur'."

"Is that all?"

"Well, you might throw in a little scriptur'. Jest say: 'Her children rise up an' call her Betsy.'"—*Atlanta Constitution.*

ROMAN MONOLITHS.

COLUMNS of an astonishing size were erected, in which the shaft was one piece of stone. For this purpose it was hewn in the quarry into the requisite form and was then rolled over the ground, or moved by the aid of various mechanical contrivances and by immense labor to the spot where it was to be set up. The traveler now sometimes views with wonder the unfinished pillars, either occupying their original site in the quarry or left after having performed one-half their journey, while he finds other shafts arranged in their intended position, and consisting of a single piece of marble, alabaster, porphyry, jasper or granite, which is either corroded by time or retains its polish and its varied and beautiful colors according to the situation in which it has been placed or the durability of its substance. The mausoleum of the Emperor Hadrian—a circular building of such dimensions that it serves as the fortress of modern Rome—was surrounded by forty-eight lofty and most beautiful Corinthian pillars, the shaft of each pillar being a single piece of marble. About the time of Constantine some of these were taken to support the interior of a church dedicated to St. Paul, which some years ago was destroyed by fire. The interest attached to the working and erection of these noble columns, the undivided shafts of which consisted of the most valuable and splendid materials, led munificent individuals to employ their wealth in presenting them to public structures. Thus Crœsus contributed the greater part of the pillars to the temple at Ephesus. In the ruins at Labranda now called Jackly, in Caria, tablets in front of the columns record the names of the donors.

SCREWS IN STONE WALLS.

A DUSSELDORF engineer, knowing from experience that wooden dowels for the purpose of securing screws in stone are apt to weaken the walls and do not afford the desired solidity, has devised an ingenious method of obtaining a firm anchorage. For this purpose a wire of suitable thickness is coiled onto the screw, so as to follow the threads of the same and to form a kind of screw nut. The coiling may commence near the head or thick end of the bolt and proceed toward the point by laying the wire into or between the threads, so as to touch the bottom of the same, the section of each screw thread being perfectly triangular or

trapezoidal and the core of the screw conical (similar to a wood screw). After arriving at the point of the screw, the wire may be wound backward over the helix already wound on, but with a steeper pitch, so as to leave wider interstices between consecutive convolutions of the wire. After the wire has been laid on so as to form a nut, and then the screw withdrawn, the nut or wire coil is introduced into a hole which has been drilled or otherwise formed in the wall for this purpose, and which is slightly wider than the diameter of the nut measured over the outer layer of the wire, after which the interstices are filled up with plaster of paris cement, or similar binding material in a plastic condition. When the said binding material has become sufficiently hard and firm, the screw bolt which has served as a core, or another screw bolt having the same diameter and pitch; is screwed into the wire coil, and may now be screwed out and in repeatedly without damaging the wall, because the wire serves as a screw nut, which is secured to the stone or wall by the cement or other binding material.—*Philadelphia Record.*

LORD PENRHYN AND HIS SLATE WORKERS.

THE disagreement between Lord Penrhyn proprietor of the extensive Bethesda slate quarry in North Wales, and his employes, which has resulted in the lockout of several thousand men, would doubtless have had no more public interest than scores of similar disagreements between employers and employes but for the fact it has assumed a phase that is practically a defiance of the British Government by the lordly proprietor and imperils the conciliation act passed by Parliament last year.

The original disagreement involved questions of wages, bargains, the gang system, various privileges or disadvantages of rock workers, cutters, and "rybelwyr," the last of whom had to do with the loose stuff left in the process of cutting the slate rock. These are all technical points upon which only an expert could express an intelligent opinion. They were, however, the occasion of much friction, which in course of time developed such feeling that the quarriers refused to accept the decision of the manager and appealed directly to Lord Penrhyn himself. A hearing was granted and a committee of seven was appointed to represent the men in an interview. Unfortunately for the men they could not speak or readily understand English and they were unable to present their case as forcibly as they could have done in their own language or answer the points raised by the proprietor. The interview was taken down in shorthand by a representative of Lord Penrhyn and a full report published in a number of Welsh and English papers. The effect upon public opinion was decidedly unfavorable to the employes, and the men claimed that they had suffered an injustice in not being permitted to present their case in their own way. A second interview was granted, which was as unsatisfactory as the first.

Several members of the deputation afterwards made themselves offensive by their words or actions, and in September they were summoned to appear before the manager. These men were directed by the committee of seventy-one, which controls the affairs of the quarriers (but has never been recognized by Lord Penrhyn) not to present themselves at the office of the manager unless they were accompanied by an interpreter. They obeyed the order of the committee and were dismissed for disobedience, and the entire committee of seventy-one was suspended indefinitely. The reply of the men to this proceeding was an order to strike.

Before long the men became anxious to return to work and sought to secure a settlement of the trouble according to the provisions of the conciliation act. They appealed to the Board of Trade, the department of the government having such questions under its jurisdiction, and the secretary, Sir Courtenay Boyle, promptly responded. The Secretary found the men willing to surrender on all but two preliminary points involved, consenting even to reducing the number of their representatives to two, neither of whom should have been members of the suspended committee nor of the original deputation. The two points upon which they insisted were that an official of the Board of Trade should be present at the first conference with Lord Penrhyn or his representatives and that they should be allowed a short-

hand writer of their own. Lord Penrhyn refused to consent to either point and replied in writing that the presence of a government official would "establish a precedent for outside interference with the management of his private affairs." Sir Courtenay Boyle replied that "the board cannot admit that the settlement of a prolonged dispute affecting some thousands of men and their families can be regarded as a matter of private interest only." Thereupon Lord Penrhyn ordered his quarries closed and discharged all his men, pensioning a few who had been loyal to him.

The action of Lord Penrhyn may have far-reaching results. The declaration of the Secretary of the Board of Trade that it cannot be admitted that the settlement of prolonged disputes between employers and employes is a master of private interest only may seem to indicate that if voluntary arbitration and conciliation are refused or resisted by either party to a disagreement compulsory arbitration will be provided for. It is a question whether employes would not be as much opposed to this as employers. The best results are to be secured for both parties under the plan of conciliation or volununtary arbitration, and it will be cause for regret should the action of Lord Penrhyn result in the nullification or repeal of the present law.—*Chicago Tribune.*

PREHISTORIC HONEY FOUND IN A STONE QUARRY.

A DISCOVERY that has attracted considerable attention and speculation was made recently at the quarry of the Missouri River Stone company, a mile south of Atchison, Kan. The quarry is on the western or Kansas bluff of the Missouri river. The area of the company's operations had to be extended, by reason of increase of orders for rip-rap stone, and 100 feet of ground in length by 25 in width was denuded of the primeval forest, and the earth above the rock, averaging about 18 feet in depth, scraped off.

After the rock had been reached a hole of about 15 feet in depth was drilled into by a steam drill. The explosives were emptied into the hole and tamped down and a fuse attached. After all this there was a great blast and a great upheaval of rock. When the workmen went to ascertain the results of ths blast they discovered a great cavity in the original rock, that as they think, had been many years ago a great bee-hive. There were no bees, but they account for that by the dust on the floor of the cavity. That there was honey there and palatable honey is vouched for by all the workmen. The cavity in the rock was a perfect bee-hive, and in its congeries of hexagonal cells differed in no particular from the architecture of the busy bees of prehistoric as well as present time.

Whether this honey is the product of bees of this age, which has found some opening through the mountain of earth above to the rock's cavity, or whether it is honey that has been sealed in the everlasting rock since the flood is a debatable question, but the concensus of opinion gives to it the title of "prehistoric honey."

TESTING THE STRENGTH OF SOIL FOR BUILDING.

THERE is very little to be found in technical literature on the weight that certain soils will support. The few tables extant generally do not indicate with sufficient clearness under what conditions they have been compiled. Rudolf Mayer, describes, in the "Zeitschrift des Oesterreichischen Ingenieur und Architekter Vereins," an instrument specially devised for this purpose. It is certainly not complicated, and though it is hardly meant for the ordinary builder it may prove useful in its present or an improved shape. There is a heavy piston screwed into a cylindrical guide block carrying a platform on its top, on which the weights, iron plates of about 20 lbs. weight, are to be placed. The piston and its guide slide in a strong cylinder which forms one casting with the bed-plate. This bed should be wide. There are, further, three legs in the plane of the bed, with pins at their ends, by means of which the instrument is fixed in position. The guide carries a side-arm holding a micrometer screw dipping below into a mercury cup, from which a capillary tube branches off. The diameters of the cup and the indicator tube are such that the depression of the screw is marked tenfold. When the weights are applied, the piston will sink more and more, fairly proportionally at first; this would graphically give a straight line. When the line changes into a curve which becomes steeper and steeper, it is clear that the bearing limit of the soil has been reached.

BOOKS AND PERIODICALS.

"FOUR YOUNG EXPLORERS; or Sight-Seeing in the Tropics." By Oliver Optic. Cloth. Illustrated. From Lee & Shepard, Publishers, Boston.

The preceding volume of the series left the hero, Louis Belgrave, and his friends at Sarawak, in the island of Borneo. The four young men here spent three weeks in hunting, fishing and adventure, visiting the Dyak villages and learning of the manners and customs of this interesting people, while the rest of the party proceeded in the "Guardian Mother" to Siam. On leaving Borneo the explorers decided to make the trip to Bangkok in the steam launch, where they arrived in safety. From there the reunited party went on to Saigon in French Cochin China, across the China sea to Manilla in the Philippine Islands, and thence to Hong Kong, Shanghai, and Pekin in China. They inspected all the points of interest in the places visited. Amid such new and varied surroundings it would be surprising indeed if the author, with his faculty of making even the commonplace attractive, did not tell an intensely interesting story of adventure as well as give much information in regard to the distant countries through which our friends pass and the strange peoples with whom they are brought in contact. This book, and indeed the whole series, is admirably adapted to reading aloud in the family circle, each volume containing matters which will interest all the members of the family. Mr. Adams, on his trip around the world, is at present in China at the very point where this narrative ends, gathering material for the continuation of the All-Over-the-World Library. [Price $1.25.]

"COLUMBIAN PRIZE CHARADES," by Herbert Ingalls, Authorof, "The Boston Charades." From Lee & Shepard, publishers, Boston.

The charade is having its day as never before since the art of printing was made known, and this new volume by the author of "The Boston Charades" will certainly give pleasure to the many who are fond of this kind of entertainment. In the new volume there are one hundred and sixty numbers of this sort of puzzle. Prizes, in a series of ten, are offered to persons more or less successful in recording the solutions. The particulars regarding competition are given in the book itself. The newer volume gives, in an appendix, the solutions of "The Boston Charades,"

Concerning Boston Charades, Mr. Ingalls' previous book, the Public Ledger, of Philadelphia, says: "The conundrum has usually done duty to quicken sociability and provoke conversation. But the conundrum must now retire from public life before this collection of charades, which claim originality, wit, and poetic charm. One hundred and sixteen words are thus tortured and twisted from their meaning by ingenious play and turns, and if young people have the mind to learn the verses rather than others of classic and modern beauty, the little book will serve its purpose 'to give pleasure around the evening lamp at home; in the friendly competition of a party or of a club; in the sweet idleness of summer days by the seashore or among the hills.'" [Price $1.00]

The *Review of Reviews* for February makes "A Plea for the Protection of Useful Men" from bores and "societies," and all well-meaning people who bother the life out of public men by letters and calls on the pretext of seeking assistance in some worthy undertaking. The editor of the *Review* publishes letters on this subject from the late Gen. Francis A. Walker, written only a few weeks before his death. In one of these letter General Walker wrote, "I am not well, and neither callers nor correspondents have any mercy."

A discussion of "Tendencies in Athletics for Women," is contribnted to the February *Popular Science Monthly* by Sophia Richardson. The writer points out the superiority which earnestly played games have in some respects over gymnasium exercises, and shows how American college girls waste time in forcing a dulled brain through tasks that could be mastered easily and quickly with the aid of invigorating exercise.

Mr. Henry Van Brunt, in the *Atlantic Monthly* for February, himself an architect of distinction, traces the history of architecture in the United States by drawing a parallel between Bulfinch, the great architect of the last century, and Root, the architect of the World's Fair, whose death was as deplorable as his genius was extraordinary.

The February *Chautauquan* presents for the introductory paper "Masterpieces of French Painting," by Horace Townsend, with excellent reproductions of some of the most famous French paintings. The variety and merit of the other articles testify more than ever to the rank of this magazine as a standard for home reading.

RECENT PATENTS.

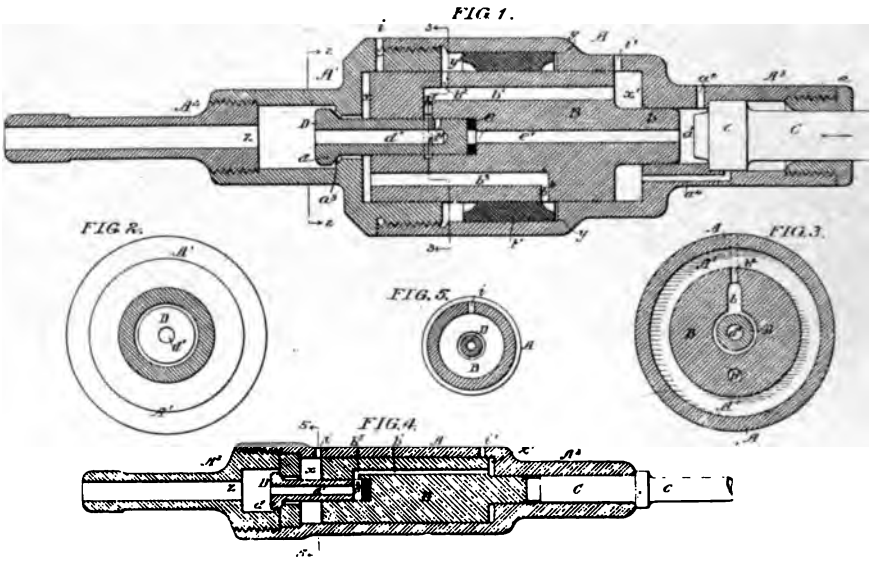
SEVERAL PNEUMATIC TOOLS.

ILLUSTRATIONS herewith show the construction of four of the more recently patented pneumatic tools. There are many other tools of this class to be mentioned, and inasmuch as considerable litigation has been had over the patents on these instruments it will be of interest to all stone-workers to have the original drawings presented for their inspection.

The illustrations of first tool shows the invention of John G. Carlinet, of Philadelphia.

The illustrations of second tool show the invention of Joseph Boyer, of St. Louis.

This invention is an improvement on the tool patented by Mr. Boyer April 16, 1895; but the several features of the invention are not re- the tool. Fig. 2 is a transverse sectional view on the line 2 2, Fig. 1. Fig. 3 is a transverse sectional view on the line 3 3, Fig. 1. Fig. 4 is a longitudinal sectional view of the tool in its simplest form. Fig. 5 is a transverse sectional view on the line 5 5, Fig. 4. For a full exemplification of the method of operating this tool see complete specifications.



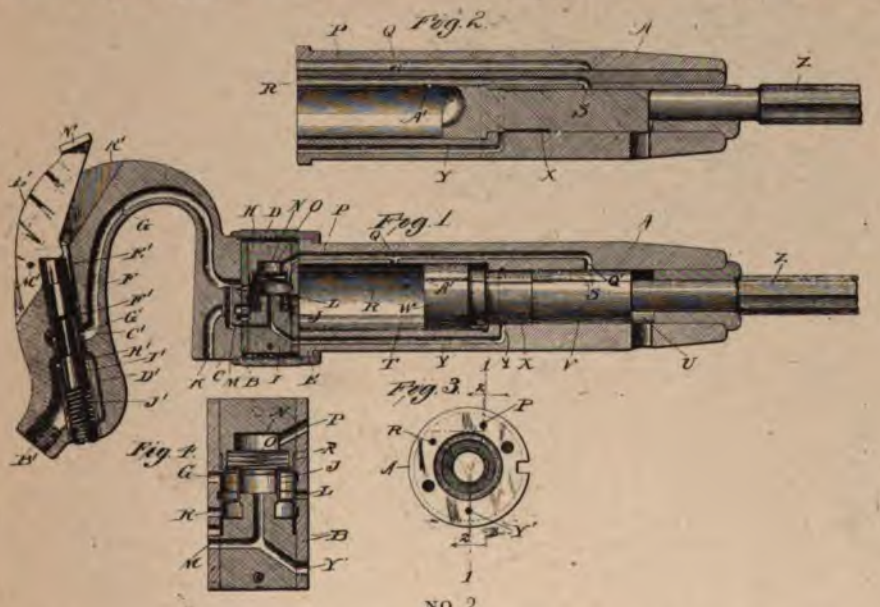
The object of this invention is to so construct a pneumatic tool that it can be made of few parts, and in which a single valve controls the admission of fluid under pressure to the ends of the cylinder. A further object is to so arrange the tool-carrier in the casing that it will not be affected by the fluid in the cylinder when the hammer is returned. A still further object is to so construct the parts that the vibration of the tool will automatically cease as soon as removed from the work, dispensing entirely with the ordinary hand-valves.

Figure 1 is a longitudinal sectional view of

stricted in their utility and application to that or any other particular tool, but may be employed to advantage in widely-differing tools, as will be apparent from the detailed description. In the accompanying drawings, Figure 1 is a vertical longitudinal section of the complete tool approximately on the line 1 1, of Fig. 3; Fig. 2, longitudinal section of the piston-chamber and piston approximately on the line 2 2, of Fig. 3; Fig. 3, a view of the rear end of the cylinder or piston-chamber, showing the position of the several ducts in the wall of the cylinder; and Fig. 4 an enlarged vertical

on of the valve-chamber and valve with alve in opposite position from that shown g. 1.

is invention may be said to consist in three res—first, novel means relating to the use e pressure medium for giving the piston ckward or return stroke; second, in means using the tool to be automatically thrown of operation, even though the pressure- ly is not cut off, whenever the cutting-tool t in position to receive the blow of the pis- and third, in a novel throttle-valve for con- ing the admission of the pressure-supply. the tool of prior patent above referred to iston was reset or given its return stroke eans of a coiled spring confined in the



NO. 2.

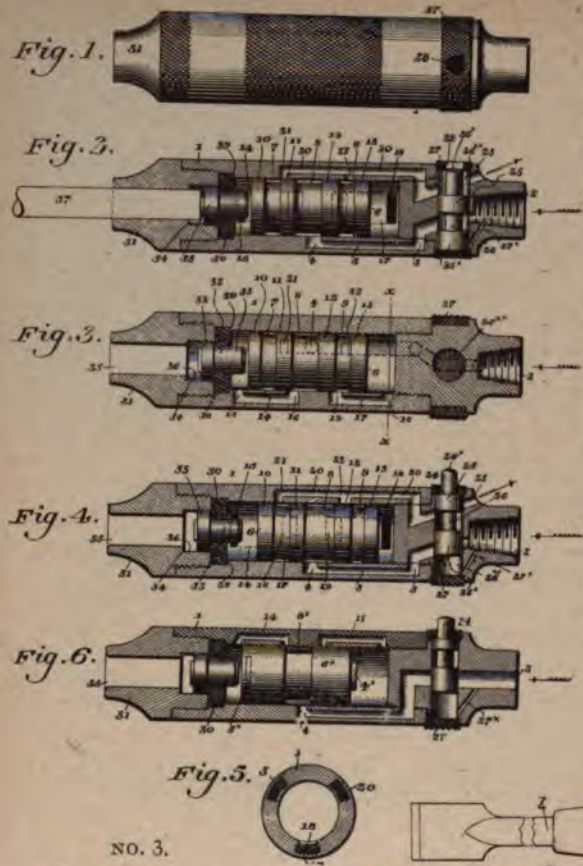
t end of the piston-chamber, the pressure- ly being intermittently admitted only to rear end of said chamber. It has been d undesirable, however, to use such reset- springs in tools of large size, and in the here presented the inventor employs the sure medium both for driving the piston ard to deliver its blow and for resetting it.

ol No. 3 is the invention of Julius Keller, hiladelphia, and consists of an improved truction of pneumatic tool which is espec- adapted for use in dressing and carving es of all kinds, in calking boilers, chipping ls, and for every kind of work in which the hammer and mallet and chisel are ordinarily employed, provision being made for reducing the number of parts and simplifying and cheapening the construction throughout, whereby the durability of the tool is greatly increased and the noise and vibration incident to the extreme rapid movement of the hammer are reduced to a minimum.

Figure 1 represents an exterior view of a pneumatic tool embodying this invention. Fig. 2 represents a longitudinal sectional view of the same, showing the relation of the hammer to the inlet and exhaust ports. Fig. 3 represents another longitudinal sectional view showing more clearly certain of the inlet and exhaust ports, the hammer being in the same position. Fig. 4 represents a view similar to Fig 2, the hammer being shown in another position. Fig. 5 represents a transverse section on line x x, Fig. 3. Fig. 6 represents a longitudinal sectional view showing a modified form of hammer.

Tool No. 4, is the invention of Wm. B. Murray, of Chicago.

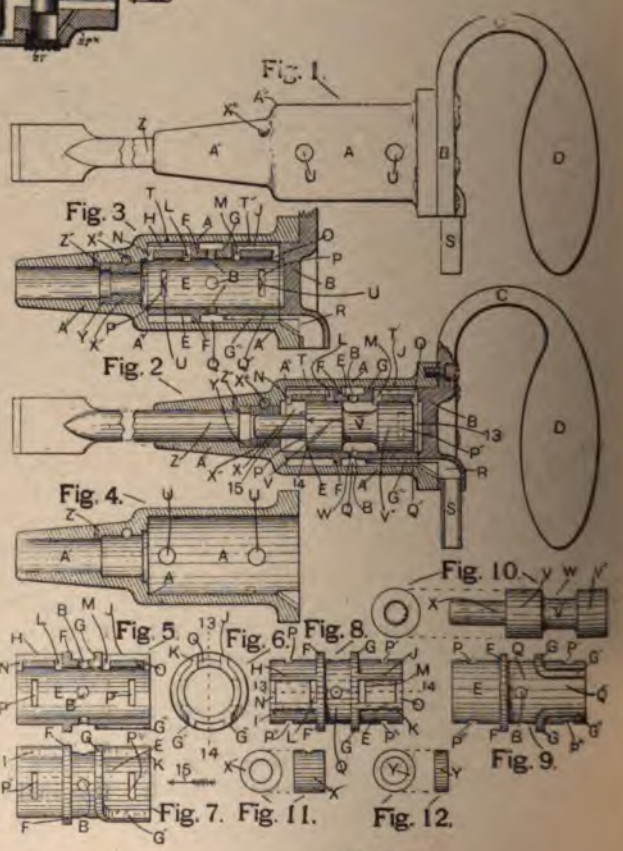
This invention relates particularly to machines which are adapted to operate tools for cutting stone, and the object, says the inventor, is to provide a construction which is better adapted to the purpose than the machines of this kind in ordinary use.



NO. 3.

Figure 1 is a side elevation, and Fig. 2 a partial side elevation with one-half of the casing and cover therefor, and the cylinder, together with several minor parts broken away to show a longitudinal vertical section, and the double piston in position within the cylinder in elevation. Fig. 3 is same as Fig. 2, exdect that the double piston and chisel-shank are removed and the handle-arm broken away. Fig. 4 is a separate view of the casing in sections, same as shown in Figs. 2 and 3. Fig. 5 is a separate view of the cylinder in section, same as shown in Figs 2 and 3 or on line 13 14, Figs. 6 and 8. Fig. 6 is an end elevation of the cylinder, looking in the direction of Fig. 7, as indicated by arrow 15. Fig. 7 is a side elevation of the cylinder, and Fig. 8 is a plan view thereof. Fig. 9 is a plan of the bottom of the cylinder, which view is diametrically opposite that shown in Fig. 8. Fig. 10 shows, repectively, an end and a side elevation of the double piston and the plunger which is integral therewith. Fig. 11 shows, respectively, an end and a side elevation of a removable bushing for packing and guiding the piston-ram. Fig. 12 shows, respectively, an end and a side elevation of a detachable bushing which serves as an abutment between the plunger and the bushing shown in Fig. 11, the same serving as a stay to limit the inward movement of the toolshank.

For a correct understanding of the operations of these several specimens of pneumatic tools, reference should be had to the complete specification. We have not the space in one issue of STONE to give these. It will suffice, we think, to show the complete drawings, which are in a measure self-explanatory.



NO. 4.

MACHINERY AND SUPPLIES.

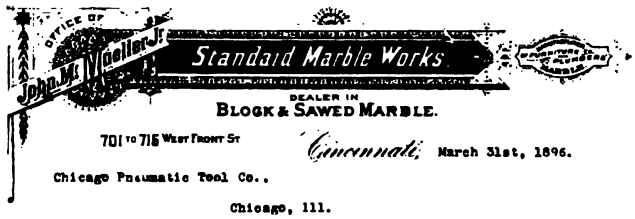
[Matter appearing under this head is compiled and edited from data furnished by the advertiser, and should not be accepted as the opinion of the publishers.]

VICTORY FOR THE BOYER PNEUMATIC HAMMERS.

To the Trade:

We are pleased to state that on January 7th the United States Circuit Court of Appeals, at New York, in the infringement suit brought by the American Pneumatic Tool Company against The Bigelow Company, of New Haven, Conn., for using the Boyer hammer, decided in favor of the defendant, and reversed the decision of the lower court, thus confirming the position we have always taken, and the assurances which we have

given the trade, that the Boyer hammer did not infringe the patents of the American company, and furnishing a complete answer to the threats and misrepresentations which that company has been making with regard to the Boyer hammers.



Chicago Pneumatic Tool Co.,

Chicago, Ill.

Gentlemen:-

After giving several makes of hammers here a very fair test I have determined and concluded that your hammer is the best for my use here, and, for this purpose beg you to book my order for the following hammers:

(7) hammers of your O. size

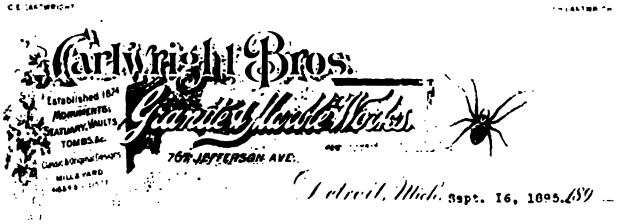
(3) " " " U. "

(2) " " " P. "

I want you to see when you are sending on these hammers to me that they are in good perfect working order before they leave your place. Send me with these hammers sufficient steel so that I can use them to good advantage. I say, and, that without the least hesitation at all that your hammer is as good as any I have seen or used, in fact, I prefer it to all others.

Yours very truly,

John M. Mueller Jr.



Chicago Pneumatic Tool Co,

Gentlemen,

In answer to your letter of enquiry concerning the Hammers we bought of you, We will say, Up to the present time we are, To put it mildly, Delighted with them. The machines have been running steadily for over a year and We do not believe one of them has missed a stroke. If there is any one interested who is doubtful as to the efficiency of your Hammer, You ask them to write us for information,

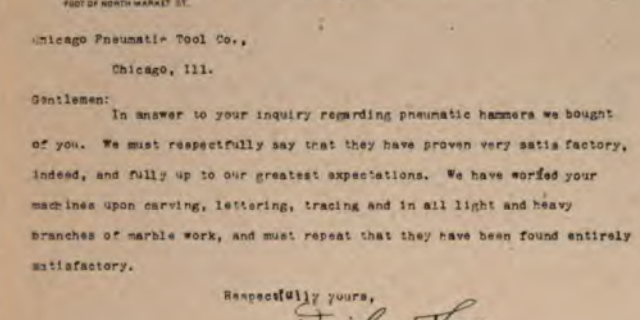
Yours,

Carl Wright Bros.

In addition to our regular Boyer hammers, which are familiar to the trade and have acquired such a high reputation, we are now prepared to furnish a still further improved style of hammer, which we have designated The New Boyer. The valve mechanism of this new hammer is entirely different from the old, and is designed to accommodate an increased length of piston chamber and an increased length of piston stroke, and consequently materially increases the force of the blows of the piston in a tool of given size, without increasing the length of the tool as a whole. It also reduces the vibration of the hammer to practically nothing, so that in both of the above respects the new hammer is superior to the old. We will be pleased to furnish estimates on compressor and air hoists and complete air plants for trade. We are prepared to furnish either style. *All tools sent on ten days' trial, subject to approval, and guaranteed for one year against repairs.* Our

new catalogue is in the hands of the printer, and will be ready for distribution about February 1. We desire to

DAVIDSON & SONS,
INCORPORATED
MARBLE DEALERS
AND MANUFACTURERS.
Chicago Sept. 25, 1895.
FOOT OF NORTH MARKET ST.
Chicago Pneumatic Tool Co.,
Chicago, Ill.
Gentlemen:
In answer to your inquiry regarding pneumatic hammers we bought of you. We must respectfully say that they have proven very satisfactory, indeed, and fully up to our greatest expectations. We have worked your machines upon carving, lettering, tracing and in all light and heavy branches of marble work, and must repeat that they have been found entirely satisfactory.
Respectfully yours,
Davidson & Sons


HENRY MARQUARDT,
Marble and Granite Monuments, Statuary, Sarcophags,
Entrances, Etc.,
Wholesale Dealer in
GEORGIA MARBLE FOR BUILDINGS AND CEMETERY WORK.
Models and Designs Made to Order.
St. Louis, Mo. Sept 15, 1895.
Chicago Pneumatic Tool Co
Mr J. W. Duntley
Dear Sir
The Six (6) tools we have in operation, I am glad to say, give very good satisfaction, they work with ease & can be handled without any difficulty and they fill my expectation
Respt. Yours
Henry Marquardt

have all stone-workers possess a copy of it. Furnished free on request.

CHICAGO PNEUMATIC TOOL CO.,
No. 635 Monadnock Bldg.,
Chicago, Ill.

THE GOOD ROADS MACHINERY CO.

The American Road Machine Co., of Kennett Square, Pa., and the Aultman Company, of Canton, O., have made an important change in the marketing of their improved road and street machinery, and announce that hereafter the entire output of the two concerns in machinery of this class will be sold by the Good Roads Machinery Co., with headquarters at Kennett Square, Pa. This arrangement it is believed will prove beneficial to the manufacturer, dealer and the purchaser, and will enable the Good Roads Machinery Company to offer a choice to its patrons of the very best machine and tools on the market for road-building and repairing.

The Bedford Quarries Company has opened an office at No. 1 Madison avenue, New York, where it will be represented by Mr. A. F. Shuman, sales agent.

SAW BLADES.

There is not enough care taken by stone sawmill superintendents, in saving expense in the important item of saw blades, and getting the most efficient service with their wear. The selection of saw blades doesn't look like a serious matter to most operators, but we venture to say if tab were taken on the life of the blades used on different qualities of stone it would astonish most of them to see the loss they suffer from the selection of poor blades. So it is important to have the best blade made, and to procure it from those who have made the manufacture of blades a specialty. This concern is the J. Painter & Sons Company, of Pittsburgh, which is one of the largest iron and steel manufacturing com-

panies in America. Its saw blades are cut carefully to exact lengths required and straightened, by the most perfect system yet devised. Hence, this fact alone warrants their superiority over blades forged by the country blacksmith, and which are usually of the hit-or-miss quality in temper or form. Better buy your blades from the manufacturer who understands the principle in their construction and who has the facilities to make them perfect.

[*From the "Philadelphia Record."*]

AN INVENTION THAT PROMISES TO REVOLUTIONIZE STONE-CUTTING.

GIVEN A SUCCESSFUL TEST.

THE RAPID STONE SAW WILL DO AT LEAST TEN TIMES THE WORK OF THE OLD-FASHIONED STONE SAW IN USE.

"A saw for cutting stone that will do ten times the work the old-fashioned saw accomplished, and do it better, too, is an invention that seems destined to revolutionize the stone industry. Such a saw has been invented and was given a practical test recently, at Wood's stone yard, on Thirtieth street below Chestnut.

"The saw is known as the Rapid stone saw. "The saw that has been used by generations of stone-cutters consists of a straight blade of steel without any teeth, and works with a pendulum-like movement, laboriously wearing away the stone upon which it operates. The Rapid Saw is made on entirely different lines. In the first place it is provided with a series of teeth about four inches square, that are formed of separate pieces of steel and may be replaced in the blade as they wear away. These teeth are considerably thicker than the blade itself, which is made unusually thin so as to freely admit of the working in of the shot that are used in connection with the sawing as an abrading material. The action of the new saw is different from that of the old. Instead of a pendulum movement it moves laterally across the stone.

"When the visitors had inspected the construction of the saw a block of granite nine feet eight inches long and about three feet thick was selected upon which to make the trial, and the machine was put in motion. In an incredibly short time the teeth had worn their way into the stone.

"Water was constantly dropping on the blade, and a workman standing by regulated the supply of shot that was constantly filtering into the rapidly deepening slot. After an hour of this work the saw was stopped and it was found that the cut was ten inches deep. With an old-fashioned machine granite of this kind was sawed at the rate of about an inch an hour. The old method, too, had the decided disadvantage of cutting the stone in an irregular manner, leaving a wavy surface that required considerable dressing to make it smooth. The surface cut by the new method requires very little dressing.

"Recently, the attention of the Franklin Institute was called to the matter, and a critical test made by them of the saw's working.

"This was so satisfactory that the Institute awarded the ELLIOTT CRESSON gold medal, only given for important inventions. It was found that the Rapid saw uot only sawed the ordinary stone much faster than the ordinary saw, but that it would cut stone that the ordinary saw made no impression upon. It will be seen, therefore, that stones may be put on the market that were heretofore considered too hard to work.

"One of the most remarkable tests of this saw was a cutting of a Freneh buhr-wheel stone of the hardest conglomerate flint, which has heretofore resisted everything but the hard steel chisel and mallet."

The Rapid Stone Saw Company (with office 630 Bourse, Philadelphia,) composed of Philadelphians, has been organized to thoroughly and immediately place this saw upon the market as it is proposed to give exclusive rights on royalty basis, the trade will doubtless hasten to possess itself of the extraordinary advantages a practical monopoly which the right to use the saw will carry with it.

It will be difficult for any one in the stone trade to bid against a competitor who has the advantage of the use of this remarkable invention.

S. F. PECKHAM

Analytical Chemist

Expert determinations of every description relating to petroleum or asphalt a specialty.

41 North Main Street, Ann Arbor, Mich.

CONTRACT NEWS.

Plattsburgh, N. Y.—The Baptist Church of Corinth, was totally consumed by fire a short time ago. The loss on the building was about $10,000: partly covered by insurance. It will be rebuilt.

Urbana, Ills.—The Presbyterian Society propose to build a new church.

Lewiston, Me.—A $35,000 chapel is to be erected at Northfield, as a birthday gift to Dwight L. Moody. Rev. Dr. F. B. Meyer, the English evangelist is interested.

Buffalo, N. Y.—Mr. J. J. Albright, of this city, has given $35,000 with which to build a new mission house. Address First Presbyterian Church.

St. Louis, Mo.—Plans have been prepared by Architect Louis Weesbecher, Temple Building, for the erection of a very handsome church for the parish of St. John Nepomuck. To be constructed of brick and Bedford stone.

Albany, N. Y.—A new church, costing $20,000 is to be erected next summer by St. Patrick's society. The Pastor will give further particulars.

Jackson, Miss.—Weathers & Weathers, of Memphis, Tenn., have prepared plans for the St. Andrews Episcopal Society. Rev. R. E. L. Craig, Rector.

Claremont, Minn.—The M. E. Society has purchased a site for the erection of a new church.

Media, Ohio.—The M. E. Society will soon commence the erection of a church. Estimated cost $10,000.

Stewartstown, Pa.—The building committee of the new Presbyterian Church are preparing plans and specifications for the erection of the edifice. Joseph Dice, of Glen Rock, is the architect.

Plainfield, N. J.—There is a movement on foot among the members of St. Stephen's Episcopal Church, toward the erection of a new building. Rev. S. P. Simpson, Rector.

Philadelphia, Pa.—Plans for the erection of a new church for the First Baptist Society will be ready soon.

Syracuse, N. Y.—An effort is being made to raise funds for the erection of a new church for the Immanuel Baptist Congregation. Rev. Harry Pethic, Pastor.

Little Rock, Ark.—Rickon & Thompson have the plans for a new $5.000 church building to be erected for the congregation of the M. E. Church, South, recently organized.

Hortonville, Wis.—The Lutheran Society of Hortonville, contemplate building a church in that city.

Muskegon, Mich.—The Second Reformed Church will erect a new edifice this spring. Address the Pastor, Rev. R. Blomendal.

Brooklyn, N. Y.—Plans have been prepared by Architect S. W. Dodge, 43 Exchange Place, New York, N. Y., for the erection of a very handsome church edifice for Christ's English Lutheran Congregation. To be constructed of buff brick and limestone, and cost $30,000. H. S. Knabmann, Pastor.

Salem, Ohio.—Plans are being prepared for the erection of a fine new church in this place, for German Lutheran Society. Address Rev. G. Knoblauch,, of 56 Columbia street, Pastor. The church will cost about $8,000.

Hartford, Wis.—The Evangelical Lutheran Church has been destroyed by fire. Loss $7,000 with insurance at $5.000.

Plattsmouth, Mo.—Rev. F. H. Freund, Pastor, will give particulars relative to the erection of a new church at this place. Bids will be received about March 1.

Aurora, Ill.—A new church edifice is to be erected here by the First Presbyterian Congregation. A building committee consisting of

Dr. T. A. Kider, H. C. Sawyer, and Mrs. C. A. Hopkins, has been appointed, and they may be addressed in reference to the erection of the new structure.

Council Bluffs. Iowa,—Address Architects Bell & Kent relative to the erection of a church for the St. John's English Lutheran Congrega tion. To be constructed of brick and stone.

Doylestown, Pa.—Trustees of United Brethren Church, of Walnut Grove. which structure was destroyed by fire, decided to rebuild a new church as soon as possible.

Brookings, S. D.—The county auditor has been instructed to secure plans for a new jail.

Kansas City, Kan.—It is stated that the county commissioners have decided to repair the jail and build sixteen new cells at a cost of about $10,500.

Lancaster, Pa.—The grand jury recommends the building of a new county jail on the ground that the present structure is unfit for use.

Paulding, Miss.—T. Q. Brune, clerk, will give particulars relative to the erection of a new jail at this place. Contract for the construction of same will be let in February.

Conyers, Ga.—Plans have been prepared by Architects Coluke & Stewart, 24½ Whitehall street, Atlanta, for the erection of a new fireproof jail for Rockdale county. The contracts for the erection of same will be let March 3, 1897.

Sidney, Iowa.—Bids will be received until Feb. 16 for the erection and completion of a jailer's residence and jail combined in Sidney. J. C. Jones, chairman.

Butler, Pa.—Plans are now being prepared for new county jail. Commissioners of Butler county will give particulars. To cost $50,000.

Sealed proposals will be received at the office of county clerk in Neillsville, Wis., until 2 o'clock Feb. 24, for construction of jail and residence for Clark county at Neillsville. Stoltze & Schick, La Crosse, Wis., architects. Address L. M. Sturdevant, chairman jail committee.

Address William Martin, Davis Island Dam, (P. O. Box 670, Pittsburg, Pa.) relative to bidding on Chanoine dam and stone masonry pier construction. Bids offered March 1, 1897.

Omaha, Neb.—Bell & Kent, the Council Bluffs architects, entered into competition with seventeen other architects in a contest to furnish the plans for a $75,000 court house at Eureka, Ill. They will give particulars.

Baldwinsville, N. Y.—The village authorities have decided to build a town hall to cost $5,000.

Upper Sandusky, O.—The question of a new court house is again being agitated and it is likely that the commissioners will put it to a vote at the spring election.

Brazoria, Texas.—A. R. Hasterson, county judge, will give particulars relative to the erection of a new court house. Bids for the construction will be received by the commissioners up to Feb. 8, 1897.

Chattanooga, Tenn.—Sealed bids will be received until Feb. 15 for the construction of a new court house at McMillinville, Tenn. R. H. Hunt, architect, Chattanooga. Bond of $10,000 must accompany each bid. A. R. Hammer, clerk and treasurer of building committee.

A new court house is to be constructed at Central City, Neb. It is to be 90x60, of stone and Golden pressed brick. To cost $32,000.

Binghamton, N. Y.—The supervisors are holding under advisement a plan to erect a stone court house. Communications addressed to the Board of Supervisors will bring particulars.

Milwaukee, Wis.—E. B. Wolcott Post, G. A. R., of this city, has adopted resolutions asking the State Legislature to place a statue of General Lucius Fairchild in Statuary Hall of the National Capitol at Washington. All G. A. R. posts in the state will adopt similar resolutions.

Benton Harbor, Mich.—The fire department of Benton Harbor and St. Joseph is soliciting subscriptions to erect a monument to five firemen, killed in September last.

Washington, D. C.—Congressman Hurley, of Brooklyn, has introduced a joint resolution in the House, appropriating $100,000 as a partial contribution towards building a monument in Fort Green Park, Brooklyn, to the patriots who perished in prison ships in New York Harbor during the Revolution.

Columbus, O.—The Governor has appointed the following members of the Sheridan monument commission: General Andrew Hickenlooper, Cincinnati; Senator Stephen B. Elkins, Elkins, W. Va.; Captain E. L. Lybarger, Spring Mountain, O.: Hon. Frank Kelly, New Lexington, O.; Hon. Lewis Green, Logan, O. The ob-

SITUATIONS WANTED.

Advertisements under this heading inserted for subscribers to STONE *free of charge. Advertiser must send 25 cents to pay postage, if replies are to be addressed in care of* STONE *Rate to non-subscribers, 10 cents per line each insertion.*

WANTED—Any quarry corporation in need of a thoroughly experienced manager or foreman would find it to their advantage to write to 20 PEARL street, Montpelier, Vt.

WANTED—An experienced Eastern marble and granite man, capable and competent to take charge of shop or business; thoroughly understand all branches; good salesman, carver, specially good on raised letters; make working drawings; drafting; office work; good address and appearance; sober; reliable. Wants position with a reliable, reputable firm. Have filled positions with and can give reference to some of the best firms in the United States. Correspondence invited. Address R. H. C., care STONE.

WANTED—By a practical stone or marble cutter, a position as foreman or manager. Am thoroughly conversant with plans. Can run either public or monumental workf. Twenty years' experience. F. L. GREENWAY, 426 Fulton street, Union Hill, N. J.

WANTED—Position as marble quarry foreman, by a thoroughly competent practical man who understands the quarry business and all modern machinery, opening new quarries, setting up derricks, etc. Address M. J. COPPS, Marble Hill, Ga.

WANTED—Position by an energetic, experienced Salesman to wholesale granite or marble in any part of the United States or Canada. Can furnish references, etc. Address "GRANITE AGENT," 327 Jefferson avenue, Oshkosh, Wis.

SITUATION WANTED—Practical Stone-cutter desires a situation as foreman, or to take charge of any job. A1 linesman; quick in figures; eighteen years experience as foreman. Address H. WATSON, 21 Royal street, Warren, Pa.

WANTED.—Graduate of Massachusetts Institute of Technology (Dept of Geology) would like position as assistant to manager or superintendent of quarry, with chance to learn business or engineering parts of trade. MYRON L. FULLER, Brockton, Mass.

WANTED—Position as quarry foreman by a thoroughly competent, practical man, who understands the quarry business and all modern machinery; opening new quarries, setting up derricks, etc. Address "F. and A. M.," care STONE.

HELP WANTED.

Advertisements under this heading 10 cents per line each insertion.

WANTED—Large quarry company of New England wants practical working foremen, capable of stripping, clearing, opening and working marble quarries. Also expert channelers, gadders and drillers. State fully experience, references and pay wanted. Address F. J. ELLSWORTH, Case Building, Cleveland, O.

TO SELL. TO BUY. TO EXCHANGE.

Advertisements inserted in this department for 25 cents per line each insertion.

FOR SALE.—Barnhardt steam shovel. Style B. In good working repair. SERGEANT BLUFFS & SIOUX CITY BRICK CO., Sioux City, Iowa.

FOR SALE.—One Ingersoll-Sergant Bar Channeler, with bits, in good order, cheap. One new C. Aultman Co. No. 4 Stone Crusher, with elevators. One new C. Aultman Co. 20 H. P. Engine, complete, cheap. Address, THE PLYMOUTH STONE CO., Plymouth, O.

FOR SALE—One second-hand Ingersoll channeling machine in first-class order, for sale cheap. Apply to LORD, BOWLER & CO., Cleveland, Ohio.

FOR SALE—Cheap, a four gang marble mill and quarries, located at Loudon, Tenn. This mill must be sold or leased within the next few months, and the best offer gets the mill. Will sell or lease mill separate from quarries if so desired. Address H. N. GREER, Loudon, Tenn.

WANTED—A counter, sinker or dishing machine for basin slabs. Cheap for cash. State maker and price. MAXWELL & DEMPSEY, Jefferson and Cherry streets, New York City.

A CHANCE TO SAVE MONEY!

"Shaw's Booklet" of second-hand Machinery for Contractors, Mines and Quarries, is now ready. Mailed free. Write for a copy. See what I have. Get my prices.

WILLIS SHAW,
506 New York Life Bldg., Chicago, Ill.

Marble Mill and Quarry For Sale

We have for sale a fully equipped Marble Mill in Knoxville, Tenn., and Quarry, 20 miles distant on railroad. Everything in mill modern and complete. Railroad Switch. Owner a widowed lady who has neither the ability nor inclination to run it. A BARGAIN IS OFFERED.

BUCHANAN & HOBBS,

Louisville, Ky.

We Need The Following

Issues of STONE to complete our files:

DECEMBER	1892
FEBRUARY	1893
MARCH	1893
APRIL	1893
MAY	1893
AUGUST	1893
SEPTEMBER	1893
OCTOBER	1893
NOVEMBER	1893
JANUARY	1894
MAY	1894
JULY	1894
JANUARY	1895
MAY	1895

We will extend the subscription term of any of our subscribers copy for copy. That is, for each one of these issues we will tack on one issue to the subscriber's term. If you don't bind the magazine, look over your numbers on hand and send to us any of them here listed, and we will be greatly obliged to you.

ject of the commission is to assist the Sheridan Monument Association in the work of erecting a monument to General Sheridan at Somerset, Perry county, O.

Jefferson City, Mo.—Senator Mott on Jan. 20 introduced a bill to appropriate $10,000 to build a monument to Thomas Benton in Bellefontaine Cemetery, St. Louis.

Plans are on foot for the erection of a memorial statue of Harriet Beecher Stowe at Hartford, Conn.

Albany, N. Y.—A bill is before the New York Legislature to appropriate $25,000 for an equestrian statue of General Slocum at Gettysburg.

Boston, Mass.—Mr. Gove, of Waltham, member of State Legislature, Jan. 2 presented a bill appropriating $30,000 to be spent under direction of the Governor and Council for a statue of General Banks on the State House grounds.

West Superior, Wis.—The old soldiers of Superior have purchased sixty acres of land near Hawthorn for cemetery purposes. They will build a large monument in Superior.

Minneapolis, Minn.—Bill presented by Legislator Olds to appropriate $3,500 for erection of a monument in Yellow, Medicine county.

The W: R. C. workers of Weoga township, Cumberland county, will erect a soldiers' monument.

St. Louis, Mo.—Plans are about completed for the Barnes Hospital, work to be commenced in March. The building, costing more than $200,000, will be built from the fund left in trust for that purpose by the late Robert A. Barnes. Smith P. Galt, trustee, 418½ Olive street.

Fresno, Cal.—Sealed proposals will be received by the Board of Supervisors of Fresno county until Feb. 16, 1897, for the construction of a county orphanage. McDougald Bros., architects. Certified check, $1,000. Bids must be directed to T. G. Hart, clerk, and endorsed "Bids for the construction of a county orphanage."

Omaha, Neb.—The bill for an appropriation of $73,000 for the erection of new buildings at the Hastings Asylum for the Incurable Insane has duly made its appearance.

St. Louis, Mo.—Plans have been prepared by Architect G. U. Heimburger, Insurance Exchange, for alterations and addition to the Masonic Home of Missouri. Buff Bedford stone trimmings; have marble tiling.

Springfield, Mass.—Plans have been prepared by Architects Gardner, Pyne & Gardner, of 33 Lyman street, for the erection of a hospital for the city of Farmingham, this state. Cost about $18,000. Bids for the construction of the hospital will be received in February,

Cincinnati, O.—Arrangements are being made by the Young Men's Mercantile Library Association to erect a sixteen-story building. Chas. B. Wilby, Rudolph Kleybolte, committee of arrangements.

Syracuse, N. Y.—Plans have been prepared by Oscar Cobb & Son, Chicago, for the erection of a $100,000 theatre. The contracts will be let in February.

Mobile, Ala.—Watkins & Johnson have prepared plans for a $50,000 building, to be erected by the Y. M. C. A.

Wheeling, W. Va.—A new passenger station will be built by the B. & O. Ry. W. W. Green, General Manager, Baltimore.

Worcester, Mass.—Plans have been prepared by Architects Fuller, Delano & Frost for the erection of a new and very handsome Masonic Temple in this city. Work on the construction of the Temple will begin soon.

St. Louis, Mo.—Plans have been prepared by Architect C. J. Bohmer, Roe Bldg., for the erection of a three-story building. To be constructed of brick and stone. Cost, $8,000.

Wilmington, Del.—Plans have been prepared by Architect F. R. Carswell for the erection of a very large factory building for F. Blumenthal & Co. Richard Patzowsky, care of the above named company, will give particulars.

York, Pa.—Plans by Architect Charles K. Ramsey, Wainwright Building, for the erection of the Exposition Business Block at Shippensburg, Pa. To be of brick and stone. Cost, $1,000.

New York, N. Y.—Architect O. Von Nerta has designed plans for the proposed new City Hall Building, which he has submitted in competition. According to his plans the building will be four stories, over which will tower an

Wm. Wolstencroft's Sons & Co.

(Frankford)

PHILADELPHIA, PA.

Manufacturers of

PNEUMATIC TOOLS

For Stone-Cutting and Carving on All Kinds of Stone.

We beg to submit the following letter which explains itself:

GEORGE HARDING,
GEORGE J. HARDING,
Counselors at Law.

FRANK S. BUSSER,
Notary Public.

LAW OFFICES OF

Harding & Harding

901 WALNUT ST.

Philadelphia, Nov. 23, 1895.

MESSRS. WM. WOLSTENCROFT'S SONS & CO.,
Frankford, Philadelphia.

Dear Sirs:--We have carefully examined your Pneumatic Tool devices, Patents Nos. 364,081 and 373,746, mentioned in the letters and advertisement of the American Pneumatic Tool Co., of New York, and the opinion of Judge Wheeler in the suit of said company against Robert C. Fisher & Co., mentioned in said letters and advertisement. We have no hesitancy in saying that nothing in said opinion or patents in any way affects your tool, and that no claim having the slightest validity upon either of said patents can be brought against you or those using your tools,

YOUR TOOL IN NO WAY INFRINGES EITHER OF SAID PATENTS and is in no way affected by said patents.

Very Truly,

HARDING & HARDING,

Per George Harding.

immense dome. Will be a very handsome structure.

Midland, Mich.—E. H. Hayes, of Detroit, is at the head of a syndicate with $100,000 capital, which proposes to erect a large Sanitarium at Cascade Springs, Kent County. A hotel is atso projected.

Richmond, Va.—Plans have been prepared by Architect William Newell, Beach Street, near Main Street, this city, for the erection of a storage building for the Old Dominion Iron and Nail works. To be five stories, have elevators. iron beams, etc. Cost, $18,000.

Winnepeg, Manitoba.—The Grand Opera House of Winnepeg, with its contents, was destroyed by fire Jan. 17. Loss $40,000. It will probably be rebuilt at once.

St. Paul, Minn.—Plans have been prepared by Architect J. W. Stevens for the erection of a three-story flat building, to be fireproof, stone, have marble tiling. Cost $60,000.

St. Louis, Mo.—Plans have been prepared by the Foell Architectural Company for the erection of a two-story building; marble trimmings. Cost about $15,000.

Philadelphia, Pa.—Plans have been prepared by Architect R. L. Perot, Bourse Building, for the erection of a gate lodge for Northwood Cemetery; to be three-story; constructed of stone.

Buffalo, N. Y.—A big glass factory is to be erected at Mannington. R. G. Parsons, secretary Board of Public Works, will give particulars.

Medina, N. Y.—The president of the School Board will give particulars relative to the erection of a new High School building in Medina. Cost $12,500.

Grand Rapids, Mich.—The Pabst Brewing Company, of Milwaukee, has purchased a lot in Battle Creek, and is expected to erect a cold storage building at a cost of $10,000, in the spring.

Peoria, Ill.—Dr. W. R. Harper President of the University of Chicago, and Henry Ives Cobb, Architect, will give particulars relative to the following: It has been decided to erect a separate building for the polytechnic school and another building for the remaining departments. Also to have an absolute fire-proof structure and $110,000 has been set aside for the buildings. Mr. Cobb is to draw plans for a school with a capacity of 500 puplis. Information can also be had by addressing the Building Committee of the board of trustees of the Bradin Polytechnic Institute.

Toronto, Canada.—Mr. Wm. Daves of the Wm. Daves Company, a member of the Imanuel Baptist church, has subscribed $10,000 for the erection of the new Tecumseh Street Baptis Church.

Kansas City, Mo.—This city is to have a new Union Depot. It will be built at once, and will equal any other in the United States. Theodore C. Bates, the well-known Eastern Capitalist, will give particulars. The depot will have every conveniance imaginable, and be a model stat ion in every respect. Mr. Bates is President of the Kansas City and Atlantic R. R.

St. Paul, Minn.—J. Frank Dann, Owatonna editor, will give particulars relative to the construction of a new opera house at Owantonna. It will be of brick or stone, three stories high cost of about $30,000.

Detroit, Mich.—A one-story boiler house is soon to be built by Buick & Sherwood, of 229 Beaufait Ave. To be constructed of brick and stone.

Athens, Ga.—$29,000 has been appropriated by the state for the purpose of erecting two buildings for the State University at Athens: Also the sum of $10,000 for the erection of a building at the State Normal School at Athens. This will be a very handsome structure.

Grand Rapids, Mich.—Wexford County will vote on a proposition to raise $5,000 per year for five years to build a court house, at the spring election.

Memphis, Tenn.—Fire a few days agoo n Bass avenue destroyed Mount Olive Baptist Church, insured and the church will soon be rebuilt.

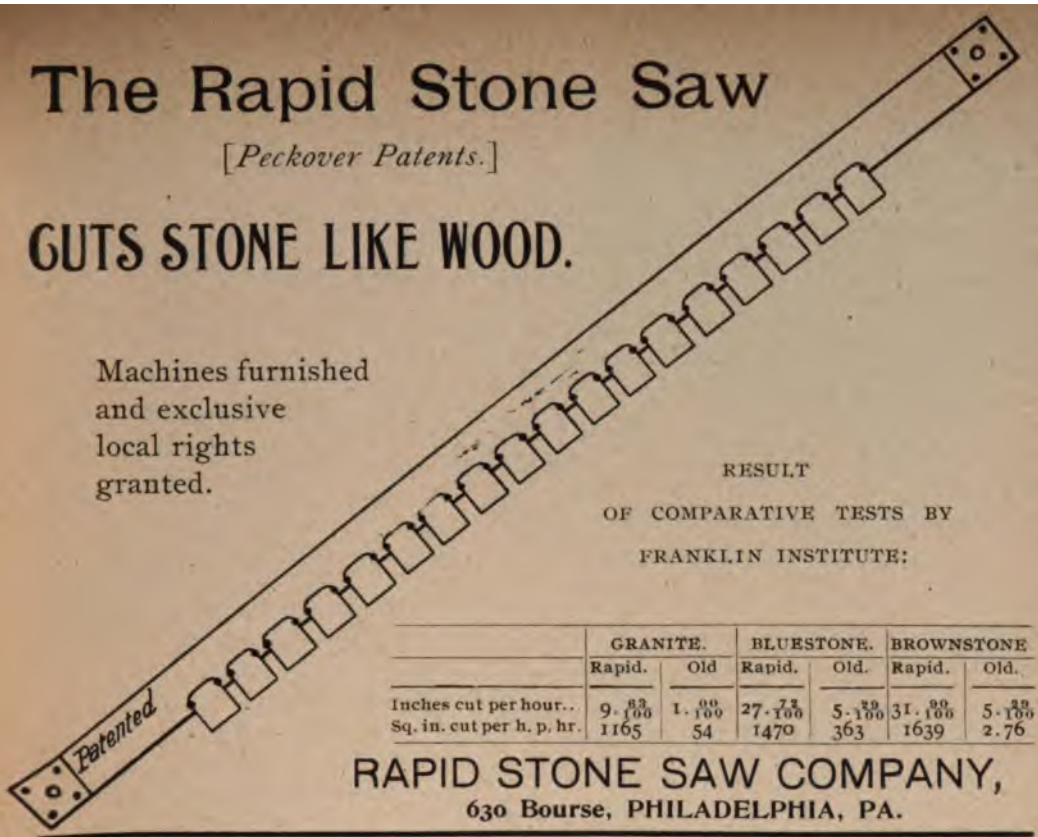
Syracuse, N. Y.—St. James Episcopal Church and Calvary Church will unite to erect new bldg. Pastor of either of the churches will give particnlars.

Detroit, Mich.—Plans are being prepared by Architects Nettleton, Kahn & Trowbridge, 1117 Union Trust Bldg., for the erection of a medical college for the Detroit College of Medicine

The Rapid Stone Saw

[*Peckover Patents.*]

GUTS STONE LIKE WOOD.



Machines furnished and exclusive local rights granted.

RESULT OF COMPARATIVE TESTS BY FRANKLIN INSTITUTE:

	GRANITE.		BLUESTONE.		BROWNSTONE	
	Rapid.	Old	Rapid.	Old.	Rapid.	Old.
Inches cut per hour..	9.$\frac{83}{100}$	1.$\frac{00}{100}$	27.$\frac{73}{100}$	5.$\frac{29}{100}$	31.$\frac{90}{100}$	5.$\frac{29}{100}$
Sq. in. cut per h. p. hr.	1165	54	1470	363	1639	2.76

RAPID STONE SAW COMPANY,
630 Bourse, PHILADELPHIA, PA.

QUARRYING AND CONTRACTING Machinery.

CATALOGUE ...ON... APPLICATION.

ST. PAUL, MINN.
CHICAGO, ILL.
CINCINNATI, OHIO.
NEW YORK, N. Y.

AMERICAN HOIST AND DERRICK COMPANY.

CHICAGO—60 S. Canal St. ST. PAUL, MINN. CINCINNATI—Carew Bldg.
NEW YORK—Havemeyer Building.

northeast corner St. Antoine and Hullet streets to take the place of the building recently destroyed by fire. For further particulars address Gen. Luther S. Trowbridge, 41 Campall Bldg.

Tonawanda, Ill,—Plans are now being prepared for the erection of a very handsome new $50,000 school building in this city. Tho President of the School Board, Mr. A. H. Crown, will give particulars.

Concord, N. H.—Land has been purchased at Enfield, on which a Catholic Church will be erected.

New York, N. Y—The Grand Central railroad station is to be practically rebuilt at a cost of $500,000. Plans for the reconstruction are almost complete and will be begun as soon as possible.

St. Louis, Mo.—Plans have been prepared by Architects Dunham & Howard, Commercial Building, for the erection of a three and a half story building for A H. Morrison, of 3830 Sheridan Avenue. To be built of stone.

Howard, S. D.—The German Methodists of this vicinity, have decided to build a church for themselves. It will be a neat structure.

Atlantic City, N. J.—Plans are now being prepared for the erection of a municipal building on the old City Hall site and the ground adjoining, this city. The City Hall commissioners will give particulars.

Gincinnati, O. -Plans by Architects Sweeney & Robinson for the erection of a three-story building for E. J. Beall. To be built of stone. Cost $2,000.

A monument is on foot for the erection of a Soldiers' and Sailors' monument to be placed on the Tunkhannock, Pa. court house square in memory of the Wyoming county volunteers in the late war.

Denver, Colo.—The commissioners of Gilpin county have accepted plans for the construction of the new court house at Central City. The building is to be 90x60 feet, to be constructed of stone and cost $32,380.

Ottawa, Ill.—The committee appointed for soliciting funds for the purpose of erecting a monument to the orginal founder of the German Catholic church of this city, Rev. Father Tusch, are meetiug with universal success.

Westport, Mo.— Alderman Pringle will give particulars relative to the erection of city hall structure two stories high, constructed of stone, cost $230,000.

Richmond, Va.—Plans by architect Chas. H. Read Jr., for erection building Union Theological Seminary, cost $75,000. To be constructed of stone. Rev. D. Robert P. Kerr, trustee, will give particulars.

St. Louis. Mo.—Plans by architects Dunham & Howard, Commercial Bldg., for 6-story apartment hotel. To be of granite and lime stone trimmings, have marble tiling.

Oneonta, N. Y.—A very handsome new school building, to cost about $22,000, is shortly to be erected in this city. Address the president of the School Board for further particulars.

Davenport, Iowa.—A special election Feb. 20 to vote on the building of a new jail to cost not more than $50,000. H. F. Jarchow, Clerk of the board of supervisors.

Plymouth, Ind.—A very handsome new school building, to cost about $15,000, is soon to be erected in this city.

Atlanta, Ga.—Drs. Cooper and Elkin of this city propose to erect and thoroughly equip a sanitarium. Plans for the building have been prepared by architect Norman. To be 4-story and contain 52 rooms. To be of granite and brick.

Jamesville, Wis.—It is now quite likely that Jamesville will get a $100,000 public building. Congressman Cooper's bill to that effect will probably pass. The mayor of Jamesville will furnish further information.

Detroit, Mich.—Plans have been prepared by Architect Joseph G. Castler, 1015 Chamber of Comerce Bldg., for the erection of a temple building for the labor unions of this city. To be 3-story, constructed of brick and stone marble tiling. C. N. J. Whelan, 1021 Fourth Avenue will give particulars.

Nashville, Ten.—A new auditorium or chapel, to cost $15,000 when completed is shortly to be constructed in this city. The plans for same have not yet been prepared. Rev. Ira Landreth, Postor, will answer all questions relative to the building of the new chapel.

Manchester, Va.—Plans are now being prepared for the erection of a new church here. For all the particulars address A. D. Shoctwell of Manchester.

GATES ROCK AND ORE BREAKER

SEND FOR CATALOGUE No. 1.

GREATER EFFICIENCY - GREATER SIMPLICITY
GREATER CAPACITY

GREATEST ON EARTH

GREATER NUMBER IN USE
GREATER DURABILITY - GREATER ECONOMY

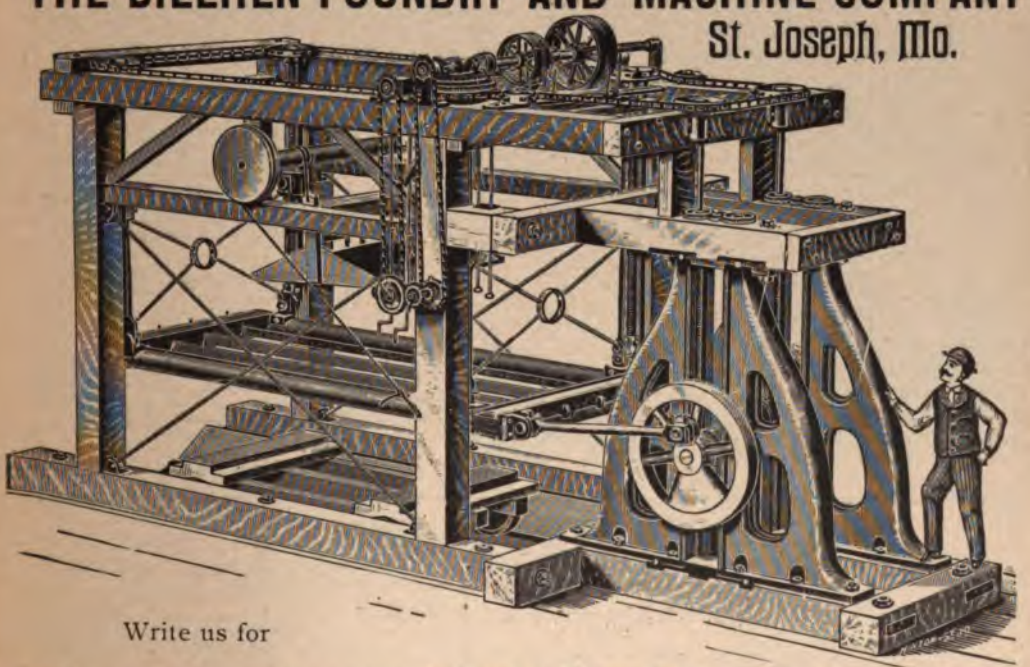
WE HAVE DESIGNED AND ERECTED THE LARGEST AND MOST SUCCESSFUL CRUSHING PLANTS IN EXISTENCE.

Agents for { Hadfield's Manganese and Chrome Steel Manufactured by Taylor I. & S. Co. Most durable for all crushing machinery.

Great Improvements this Season
Lower Prices . . . . . .
ALL KINDS OF MINING MACHINERY.
SEND FOR CATALOGUE.

Gates Iron Works
DEPARTMENT T.
650 Elston Avenue, CHICAGO, ILL.

THE BIELHEN FOUNDRY AND MACHINE COMPANY
St. Joseph, Mo.



Write us for

Stone Saw-Mill Machinery

Langdon, N. D.—E. I. Donovan, Citizens' State Bank, will erect a $10,000 stone bank building. Plans by G. W. Ross, Grand Forks.

Freeport, Ill.—J. W. Tate has prepared plans for $50,000 office building for German Insurance Company. Bids will be advertised for soon. Stone.

Hermann, Mo.—The Commissioners of Gasconade will receive bids for $40,000 court house. Plans by Legg & Elsner; St. Louis.

McMinnville, Tenn.—The Warren County Board appropriated $15,000 for erection new court house. Plans by R. H. Hunt, Chattanooga, adopted.

Camden, N. J.—J. C. Newson, architect, 1001 Chestnut street, Philadelphia, Pa., furnished plans of stone church which will be built at Camden. Cost about $60,000.

San Francisco, Cal.—Mrs. C. A. Honeet, of Gilroy; Mrs. M. F. Thorndike, of Stockton; Mrs. Olive Allen, of Santa Rosa, and Mrs. Mary E. Doncho, of the Board of Trustees of the Orphans' Home of the Independent Order of Odd Fellows, appointed by the State Assembly of the Order of Rebeckas of California, have decided upon a plan for the home which will be erected in Gilroy. Plans by Architect William Burrill, of San Jose.

Grand Rapids, Mich.—The Kent County Commissioners are taking steps towards erection of an insane asylum.

Columbus, Ohio.—It has been resolved by the Board of Education that the architect be instructed to draw plans and specifications for a plain, four-story, fireproof building. Dr. Gunsaulus or Dr. Wilson will give particulars.

Kalamazoo, Mich.—Rev. Father O'Brien, of St. Augustine's Church, purchased a large tract near the city. It is believed he will erect a convent, to cost $30,000. Plans have already been prepared.

Baltimore, Md.—Nicholas T. Haller has prepared plans for a large apartment house. Entire cost, $100,000. Five stories; trimming of light stone; handsome interior finish.

Galveston, Texas.—Mr. C. T. Cade will erect a very handsome hotel at High Island, on the Gulf and Interstate.

Albany, N. Y.—There is a probability that from the ruins of the Delavan Hotel will rise a handsome new hostelry. It will be a model fire-proof structure. Dr. William Robinson and Mr. John Van Gaasbeck are interested in the matter.

Toledo, O.—Plans are being prepared for the erection of a new theatre. The building will cost about $60,000.

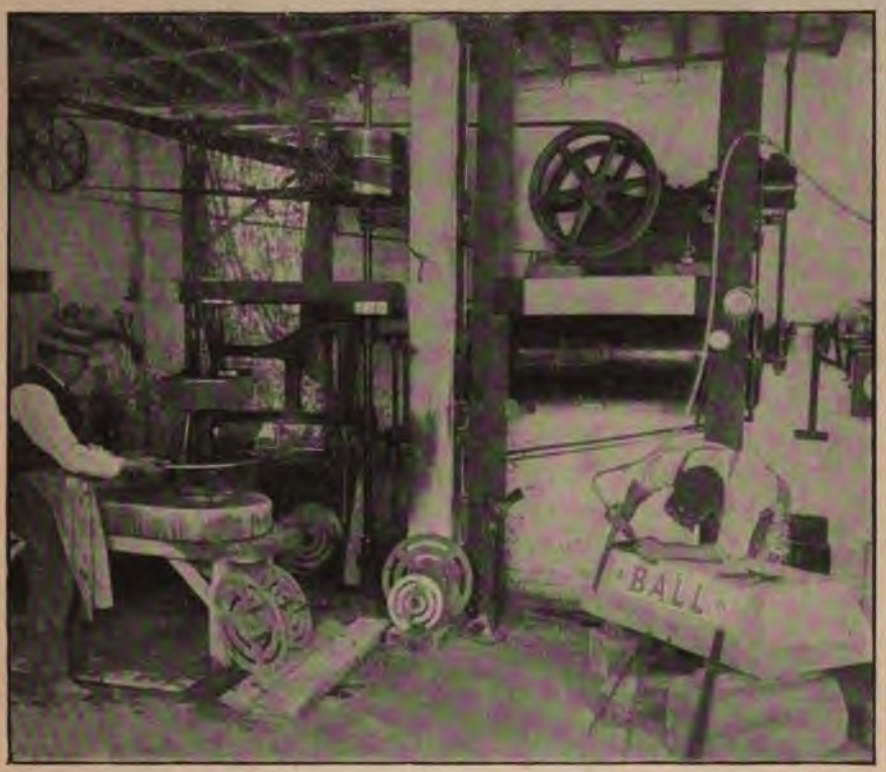
LOCOMOTIVE CRANES
ALL CAPACITIES
....For Quarry Service....
Manufactured By
INDUSTRIAL WORKS,
Bay City, Mich.
SEND FOR CATALOGUE.

VULCAN STEAM SHOVELS
Received Highest Award at World's Fair.
VULCAN IRON WORKS CO., TOLEDO, O.

Air Compressors

and

Pneumatic Tools in the Stone-Worker's Shop Produce This Result:



VIEW OF INGERSOLL-SERGEANT COMPRESSOR RUNNING CARVING TOOLS.

USED IN QUARRIES BY

Allegheny Quarries,
LANCASTER, OHIO
Corydon Stone Co.,
CORYDON, INDIANA.

STONE WORKERS

L. L. Manning & Son, PLAINFIELD, N. J.
Bowker, Torrey & Co., BOSTON, MASS.
J. S. Rowe, BEDFORD, IND.
Many Others.

COMPLETE PLANTS FURNISHED.

The INGERSOLL-SERGEANT DRILL CO.

OLD COLONY BUILDING,
CHICAGO.

HAVEMEYER BUILDING,
NEW YORK.

201 CONGRESS STREET,
BOSTON, MASS.

26 SOUTH WATER STREET,
CLEVELAND, O.

ROCK DRILLS. CHANNELERS FOR QUARRYING.

NOTES FROM QUARRY AND SHOP.

Canton, Ohio.—Harry A. Kitzmiller, of Massillon, died at Toledo, O., Jan. 15.

Waterford, Ont.—James Hammill, marble, deceased.

At the meeting of the board of governors of the New York Lyingin Hospital Jan. 14, a letter was read from J. Pierpont Morgan, offering to erect a new building for the institution, to cost $1,000,000. The only condition Mr. Morgan makes to the magnificent gift is that funds sufficent to insure the work of the hospital be raised. The board accepted the gift with thanks.

Cleveland, O.—The annual meeting of the Northern Ohio Quarrymen's Association was held Jan. 12 in the office of the Forrest City Stone Company. As this organization has no officers other than a chairman, its business did not consist in an election, but in the determination of stone prices for the new year. In this respect no change was made in the prices adopted last February, except in some relatively unimportant respects a reduction was decided upon. The chief items are twenty-five cents a cubic foot for block stone, at the quarries, and thirty-five cents a cubic foot for sawed stone.

Greensburg, Pa.—The blue rock quarries of Childs & Co. of Pittsburgh, located at Baker's station on the Ligonier Valley Road, have started up in full after a suspensions of nearly two years. Two hundred and fifty men will be given employment. The Booth & Finn quarries are also running full time. The scale has been renewed and many new men willbe given employment. The silica plant of Messrs Stuart & Co. has been increased and is now running full.

New York, N. Y.—The Granite Cutters' National Union makes the following announcement: "The season being past for giving notice of changes in bills of prices, there will be few changes for 1897. This would indicate that few troubles will arise this year, providing contractors carry out the existing wage rates. Peace being assured there is a grand chance for the union to improve financially and numerically."

The Easton Stone Quarry and Oil Company was incorporated with a capital stock of $15,000, divided into 300 shares. The company is incorporated for fifty years to carry on business in the United States, particularly in Delaware county. The principal office will be at Fort Wayne, Ind. The three directors are W. E. Mossman, J. L. Romy and R. L. Romy.

Kimmswick, Mo.—The Jefferson Stone Company, has been organized, to develop stone quarries in Jefferson County. John Loughran, of Kimmswick, is manager of the plant; G. W. Bigot, president; S. C. Bunn, secretary, and Alfred Berky, treasurer. An extensive plant will be installed.

Littleton, N. Y.—The Welch Bros. have sold their granite business to Smith Bros.

Trenton, N. J.—Roe & McCarthy, wholesale stone, reported to have been succeeded by Dennis Roe.

Perry, Iowa.—Powell & Boice, marble reported dissolved.

J. N. Forbes proprietor, has admitted John K. Berger to partnership in his plant in Chambersburg, Pa. The new firm has about $3,000 worth of orders booked, and their porspects are most encouraging. Mr. Forbes has also purchased the large steam marble and granite plant in Hagerstown opposite the B. & O. R. R. station and has already assumed control of it. He also has a fine marble yard in Waynesboro.

Clay Centre, Iowa.—F. J. Starkweather, marble, etc., reported to have been succeeded by Starkweather & Keith.

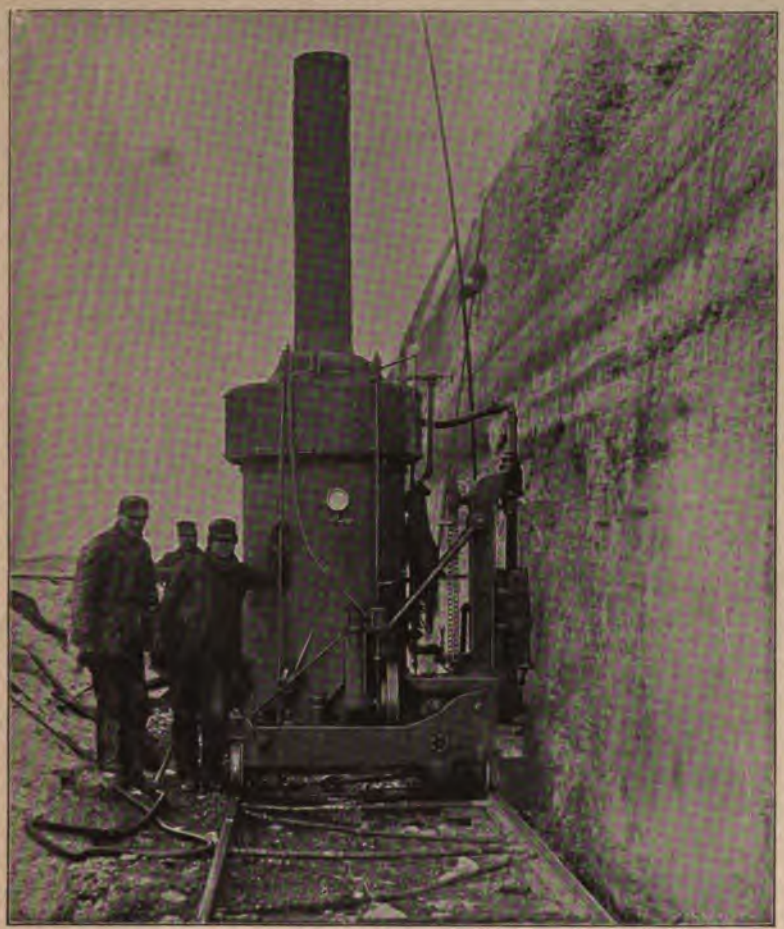
The Hawke Bros.' who ran a stone mill at Punkhannock, Pa., for several years, have recently purchased the Shields stone quarry at Springville, Pa., and will remove their mill to that place in the spring.

Monson, Me.—The boiler room and the workshed of the Monson Consolidated Slate Company were burned Jan. 16. Loss $3,500; no insurance.

Rutland, Vt.—The mills and engine and power houses of the Eureka Slate Company at North Pultney were burned Jan. 13. Loss, $15,000; insurance, $8850. More than 100 men are thrown out of work.

SULLIVAN

Channelers and Gadders!



THE SULLIVAN CARRIAGE CHANNELER USED ON DRAINAGE CANAL

55	Sullivan	Channelers	in use	on Chicago Drainage Canal.
80	"	"	"	in Vermont Marble Quarries.
27	"	"	"	in Southern Marble Quarries.
20	"	"	"	in Sandstone and Limestone Quarries.
15	"	"	"	in New York Marble Quarries.

ROCK DRILLS of all sizes and for all purposes. DIAMOND CORE DRILLS for testing mineral or quarry lands

Sullivan Machinery Co.,

Main Office, 54 to 60 N. Clinton St., CHICAGO. Eastern Office & Works, CLAREMONT, N. H.

Joliet, Ill.—William Hills, marble, reported to have released real estate mortgage for $600.

Vernon, Ohio.—J. W. Johnson, monuments, etc., reported to have recorded chattel mortgage for $515.

Guilford, Howard County, Md.—The Guilford Granite Co., stockholders held meeting recently and elected the following officers: A. H. Jouvenal, of Washington, D. C., president; Geo. L. Kirby, of Laurel, Md., secretary; A. Brunner, of Guilford, treasurer, and John White, general manager.

Boston, Mass.—Action is brought by Sovia Wattunen, administrator of Emmanuel Wattunen vs. the Rockport Granite Company, to recover $5,000, damages for the conscious suffering of his intestate, consequent upon an accident which he sustained on Sept. 5, 1895, while in the employ of the defendant at its quarry at Rockport, by reason of the alleged negligence of the defendant's superintendent. The defendant denies its liability.

The Jennings brothers, Eureka, Ill., who have been doing stone contracting in the county for several years and have built a number of bridges in different parts of the county, left town rather suddenly on 15th inst. Their families have followed them and it is supposed they have gone west. They were in debt to almost everybody in town and it is estimated that several thousand dollars would not pay what is against them. All of their tools, derrick, and everything that could be gotten hold of have been attached by parties whom they were owing.

Woonsocket, R. I.—The suit of Neil Fletcher of Uxbridge against the Cumberland Construction company, for granite, ad damnum in the writ placed at $3,000, was settled out of court Jan. 15. The bill for granite, $1,000 was paid.

Salt Lake City, Utah.—The annual meeting of the stockholders of the Mountain Stone company, will be February 9, 1897, at the office of the company, for the election of officers, and the transaction of such other business as may properly come before it. At this meeting it will be proposed to the stockholders that they order sold all of the property of the company, real and personal or so much thereof as may be necessary to pay the present debts of the company.

Warren, Ohio.—The suit commenced in Cleveland by the Freeport Stone Company against the John Huntington estate to compel the payment of $10,000 worth of the disputed Paige, Carey & Co. paper calls attention to the fact that over 90 per cent of that paper has been taken up. A gentleman who is thoroughly conversant with the matter, said that out of the $700,000, only between $40,000 and $50,000 is still outstanding, and the efforts to settle this have been blocked by the parties holding the paper.

Harrisonburg, Va.—Mr. P. M. Rauhof has opened a new stone quarry.

Evanston, Wyo.—John Brophy and Dan Dill struck a quarry of first-class sandstone at Clayton Jan. 9. They are preparing to operate same.

Wadesboro, N. C.—C. St. C. Kirk, of Charleston, S. C., is organizing a company to develop a brownstone quarry near Wadesboro. He is in the market for stone quarry machinery.

Bernadotte, Ill.—Nathaniel Easley has opened a stone quarry.

Washington, Ohio.—A large quantity of excellent stone has just been discovered within three miles of this city. A company will be organized immediately to open a quarry and place the stone upon the market.

Burlington, Vt.—Dennis Ryle and George McCormick have entered into partnership in the working of granite.

Fredericksburg, Va.—Swift & York will rebuild their stone polishing works which were recently burned.

Jacob S. Browne died Jan. 12 very suddenly. He was a member of the firm of Browne & McAllister, dealers in building stone.

Beverly, Mass.—Nathan St. Clark, for many years in the granite business in Salem, died at his home Jan. 15, at the age of 80 years.

J. M. Schoonmaker died at his residence in Wauwatosa, Wis., Jan. 12. Mr. Schoonmaker settled in Wauwatosa in 1857 and had since been engaged in the stone quarry business.

Tarrytown, N. J.—Stephen J. Sackett, owner of large quarries, died Jan. 14.

THE WARDWELL

Steam Stone Channeling AND Quarrying Machine

The original and first Stone-Channeling machine ever invented. Will pay for itself in a short time in the reduced cost of getting out stone. *Has no equal for efficiency and economy of operation.*

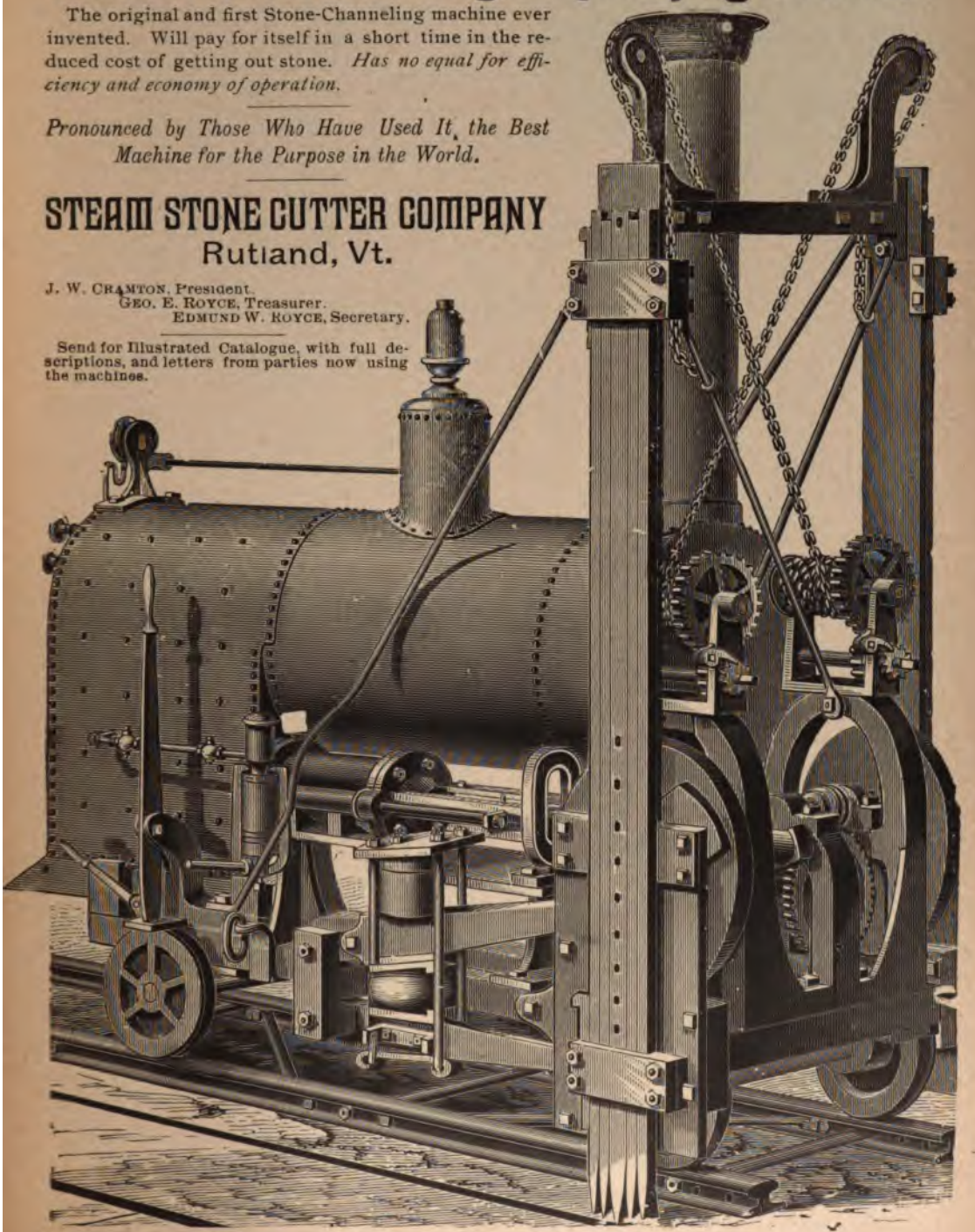
Pronounced by Those Who Have Used It, the Best Machine for the Purpose in the World.

STEAM STONE CUTTER COMPANY

Rutland, Vt.

J. W. CRAMTON, President.
GEO. E. ROYCE, Treasurer.
EDMUND W. ROYCE, Secretary.

Send for Illustrated Catalogue, with full descriptions, and letters from parties now using the machines.



Massillon, O.—The employes of "General" Coxey's stone quarry have struck for unpaid wages.

Grand Rapids, Mich.—The Vermont Marble company was given a judgment against Andrew Pilaar and others, Jan. 14, for $71,090.

Pen Argyl, Pa.—The slate quarry of H. O. Hughes, in Lehigh township sold by the sheriff to Morris Kirkpatrick.

Pen Argyl, Pa.—John W. Underhill, of New York, assignee of the Acme Slate Company of Wind Gap, has filed a bond for $113,424 as security for the faithful performance of his duties.

Easton, Pa.—The annual meeting of the Northampton Hard Vein Slate Company, whose quarry is located near Belfast, in Plainfield township, was held here on Jan. 16. The directors organized by electing James Young, president; William M. Smith, vice president; George W. Geiser, secretary; Theodore Whitesell, treasurer and business manager; A. E. Stettler, superintendent.

New York, N. Y.—Light & Louther, dealers in stone, 402, East 107th St., judgment against them for $6,151.

Easton, Pa.—The stockholders of the Pennsylvania Hard Vein Slate Company, whose quarry is at Edelmans, held their annual meeting here Jan. 14. The directors organized by electing George W. Geiser, president; M. H. Schall, vice president; Chester Snyder, secretary and treasurer; W m, H. Smith, superintendent

Whitehouse, Ohio.—J. L. Pray & Son, stone, J. L. Pray reported to have given real estate mortgage for $10,000.

Kankakee. Ill.—John H. Brayton, stone quarry, gave real estate mortgage for $4,000.

Rock Island, Ill.—A. E. Ehmer, marble, gave a chattle mortgage for $280.

Maquoketa. Iowa.—A. M. Ellyson, marble, gave a bill of sale for $2,045.

Toledo, Ohio.—George Loeb, stone contractor, reported to have recorded chattle mortgage for $300.

NEW JERSEY CAR AND EQUIPMENT CO. Lake View, N. J.

STANDARD GAUGE EQUIPMENT FOR SALE.

One 10"x16" cylinder, Saddle Tank Locomotive, price $900.

Two 10"x14" cylinder, Inclosed Steam Dummy locomotives, price $750 each.

These engines have just been through our shops, and are in A1 order.

Seven Contractors' 5 cu. yds. capacity side dump cars, dumping either side. Good as new. Price, $45.00 each.

Fourteen four-wheel Trucks, in good order.
One large Steam Shovel, has had little usage.

Locations for Industries.

The name of the Chicago, Milwaukee & St. Paul Railway has long been identified with practical measures for the general upbuilding of its territory and the promotion of its commerce, hence manufacturers have an assurance that they will find themselves at home on the Company's lines.

The Company has all its territory districted in relation to resources, adaptability and advantages for manufacturing, and seeks to secure manufacturing plants and industries where the command of raw material markets and surroundings will insure their permanent success

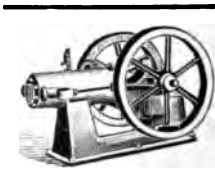
Mines of coal, iron, copper, lead and zinc, forests of soft and hard wood, quarries, clays of all kinds, tanbark, flax and other raw materials exist in its territory in addition to the vast agricultural resources.

The Chicago, Milwaukee & St. Paul Railway Company owns 6,168 miles of railway, exclusive of second track connecting track or sidings. The eight states traversed by the Company, Illinois, Wisconsin, Northern Michigan, Iowa, Missouri, Minnesota, South Dakota and North Dakota, possess, in addition to the advantages of raw material and proximity to markets, that which is the prime factor in the industrial success of a territory—a people who form one live and thriving community of business men, in whose midst it is safe and profitable to settle.

A number of new factories and industries have been induced to locate—largely through the instrumentality of this Company—at points along its lines. The central position of the States traversed by the Chicago, Milwaukee & St. Paul Railway, makes it possible to command all the markets of the United States. The trend of manufacturing is westward. Confidential inquiries are treated as such. The information furnished a particular industry is reliable.

Address,

LUIS JACKSON,
Industrial Commissioner, C. M. & St. P. R'y,
435 Old Colony Building, CHICAGO, ILL.



Gasoline Engines....

For pumping water from quarries this is the best, most reliable and cheapest engine.

Catalogue free.

The VAN DUZEN GASOLINE ENGINE CO., Cincinnati, O.

LIDGERWOOD
Hoisting Engines

Combining All the Latest Improvements,

Also

SUSPENSION CABLEWAYS,

For Quarries and General Hoisting Purposes.

LIDGERWOOD MFG. CO.,

96 LIBERTY STREET,

NEW YORK.

Old Colony Bldg., Van Buren and Dearborn Sts., Chicago.
197-203 Congress St., Boston.
40 North First St., Portland, Ore.
610 North Fourth St., St. Louis.
92-94 First Ave., Pittsburgh, Pa.
15 North 7th St., Philadelphia.
21-23 Fremont St., San Francisco.

SALES AGENTS:

FRAZER & CHALMERS, Salt Lake City, Utah, and Helena Montana.
HENDRIE & BOLTHOFF MFG. CO. Denver, Col.
ROBINSON & CARY, St. Paul, Minn.

THE NEW ALBANY M'F'G. CO.

Manufacturers of

Steam and Electric Traveling Cranes for any purpose.

Our larger cranes are Especially adapted to

STONE SAW MILL USE.

The smaller electric cranes are very economical for *Storage Yards and Cutting Sheds* in cities where current can be had (by meter) from public power station.

We build all sizes, from *three to twenty-five tons capacity*, and *any width of span* up to 60 feet.

DON'T BUY UNTIL YOU GET OUR PRICES.

We also build

WARDWELL CHANNELERS, STONE PLANERS, SCREW FEED SAW GANGS, HEAVY POWER HOISTS AND DERRICK IRONS.

THE NEW ALBANY MFG. CO., New Albany, Ind.

York, Pa.—The suit of Chas. R. McConkney vs. the Peach Bottom Slate Co., of Harford county, for $5.000, for services rendered in negotiations for a sale of the quarry some four years since, was heard before the Belaire court recently and ended in a compromise on Dec. 27, by which the plaintiff was allowed $2.250. Mr. McConkney had effected a sale of the quarry at $65,000, and $7,000 was paid thereon, the purchasers being interested in the Maryland Central Railroad. But complications in connection with the railroad led to the abandonment of the quarry purchase, and suit was brought before the United States Circuit Court for the recovery of the $7,000. Three hearings were had—in York, Baltimore and Richmond—in each of which the court declared the money forfeited. The last suit was to recover commissions and ended as above.

Xenia, O.—George Dodds, marble dealer, has taken Charles Dodds, his son, into partnership.

Maquoketa, Ill.—The Star Marble Works in West Platt street, has again changed hands, and is now in the possession of W. P. Dunlap & Son, who will continue the business.

Philadelphia, Pa.—The firm of MacDonnell & Clark was dissolved on November 1, 1896, the business of the Enterprise Slate, Marble and Soapstone Works, 122 Eutaw Street, being purchased by James Y. MacDonnell, who will carry on the business.

Knoxville, Tenn.—William Monday and Harmon Kriss, two well known quarrymen in East Tennessee, have purchased the site of the old Ross marble quarry on the Riverdale road, and are opening it. Work at the Simpson marble quarry owned by these gentlemen has been suspended until spring when it will be operated on an extensive scale.

Guilford, Conn.—John Hanna, proprietor Guilford Red Granite Quarries, deceased.

Troy, N. Y.—Wm. H. Grobe, a member of the firm of Grobe & Ford, manufacturers of slate mantels, deceased.

Mankato, Minn.—The Mankato Lime & Stone Co. purchased, Jan. 2, the machinery, paraphernalia and good will of the Craig stone quarry. The consideration being $15.000. A stone saw mill will be built immediately, and equipped with the best machinery. Officers of the company are as follows: George Pass, pres-

SECOND-HAND PLANERS FOR SALE.

60 in. wide, 60 in. high x 25 ft. long, L. W. Pond Planer.
46 in. wide, 36 in. high x 10 ft. long, Wood & Light Planer.
38 in. wide, 38 in. high x 10 ft. long, L. W. Pond Planer.
37 in. wide, 36 in. high x 12 ft. long, New York Steam Engine Co. Planer.
42 in. wide, 42 in. high x 16 ft. long, Niles Tool Works Planer.
36 in wide, 34 in. high x 16 ft. long, L. W. Pond Planer.
30 in. wide, 25 in. high x 7 ft. long, L. W. Pond Planer.
30 in. wide, 24 in. high x 8 ft. long, New Haven Planer.
27 in. wide, 27 in. high x 6 ft. long, Wood Light Planer.
26 in. wide, 26 in. high x 6 ft. long, New York Steam Engine Company Planer.
25 in. wide, 25 in. high x 5½ ft. long, Stuebner Planer.
24 in. wide, 24 in. high x 7 ft. long, New Haven Planer.
24 in. wide, 22 in. high x 6 ft. long, Place Planer.
24 in. wide, 20 in. high x 5 ft. long, New Haven Planer.

We also have a lot of CHEAP SECOND-HAND LATHES of all sizes suitable for turning stone or marble pillars, posts, etc., which we can sell very low. Write us and we will cheerfully give full information.

Prentiss Tool and Supply Co.

MACHINE TOOL DEALERS,

115 Liberty St., NEW YORK.

Chicago Store, 62 and 64 South Canal Street.

Increase your Sawing and Reduce the Cost by Using

"KRUSHITE."

Cuts Faster, Lasts Longer, Gives Better Results than Any Other Material (See Prices Current.)

A Trial will Demonstrate its Qualities.

FRENIER & LeBLANC, RUTLAND, Vermont.

Our entire plant is devoted solely to the manufacture of

Derricks, Capstans and Polishing Machinery

Write us.

SMITH, WHITCOMB & COOK,

BARRE, VT.

WATERPROOF
GRAPHITE GREASE
FOR WIRE ROPES, GEARS, ETC.

An unequaled lubricant which will not wash off. It may pay you to send for circulars.

JOS. DIXON CRUCIBLE CO., JERSEY CITY, N. J.

A. LESCHEN & SONS ROPE CO.,

—Manufacturers of—

All genuine Hercules Wire Rope is made with a Red Strand.

Best on Earth.

[Trade Mark Registered.]

920 & 922 N. Main St., ST. LOUIS, MO.

Send for Catalogue. —CHICAGO OFFICE & WAREHOUSE: 19-21 S. CANAL ST.— Correspondence Invited

BRODERICK & BASCOM ROPE CO.,

—MANUFACTURERS OF—

The Most Durable Rope made.

IT HAS NO EQUAL.

AND ALL GRADES OF

Iron and Steel Ropes and Street-Railway Cables.

ST. LOUIS, MO.

ident, D. V. Williams, Secretary, A. Schippel, Treasurer, Alex Bashaw, Manager.

Concord, N. H.—Owen Smith of this city and George Smitn of Litteton have purchased the Welsh Brothers granite works at Apthrop.

Wollington, Kans.—Chas. E. Bright has bought F. M. Penniwell's interest in the Penniwell Marble Works.

Waco, Tex.—Central City Marble Works, succeeded by R. G. Luce.

Traverse City, Mich.—The Sweers Riley Co., marble and granite, reported to have been succeeded by Harry D. Alley.

M. J. Griffin of Detroit, owns a bed of limestone that crops out two miles north of Omer, in Arenac county, which will be opened up next spring. It is on the Detroit & Mackinac Railroad, and the stone, it is reported, will come into direct competition with that of the Bay Port quarries for the Bay county market.

Barre, Vt.—Several of the companies have organized the Barre Polishing Company, and will operate the large polishing mill of C. H. More.

Keene, N. H.—The Lisbon Granite Works is the name of a new company that began operations here Jan. 1.

Adams, Mass.—C. A. Howland contemplates opening another marble quarry in town.

The strike of employes of the Portage Entry Sandstone Quarries, Houghton, is still unsettled. Fins were getting $1.35 per day, and wanted 15 cents more and full day's pay from daylight to dark. The company deducted time lost by darkness.

Glenville, N. Y.—Stephen J. Sackett, a prominent resident of this place aad owner of the Neppereco Granite Works at Pocantico Hills, was stricken with paralysis on January 4th. He is in a critical condition.

Los Angeles, Cal.—The deep water harbor commissioners and the Southern Pacific and Terminal engineers are busily engaged in inspecting granite quarries. The Declez quarries at Colton and the granite in the Chatsworth pass were inspected. The Santa Fe officials had the committee inspect the granite on their line.

THE CONCORD
(Jenny Lind)
Polishing Machine.
MANUFACTURED ONLY BY THE
CONCORD AXLE CO.,
PENACOOK, N. H.
Send for Circular and Price-List.

HOISTING, MINING, BRIDGE ERECTING,

Dock Building,
Pile Driving,
Coal Hoisting and
Quarry Engines
of any power, Sugar Cane transferring engines, transferring machines for depositing cane from car to carrier, with my improved Patent Friction Drums with or without Boilers. Any amount of reference given. Established 1870. Send for Catalogue.
J. S. MUNDY, Newark, N.J. 1744 Market St., Philadelphia, Pa., 22 Light-st. Baltimore, Md., 117 Water-st., Pittsburgh, Pa., 349 S. Jefferson-st., Chicago, Ill., 715 N. Second-st., St Louis Mo., 34 Fremont St., San Francisco, Cal., 85 Front-st., Portand, Ore., 4th and Wakouta-sts., St. Paul, Minn., 218 Congress-st., Boston, Mass.

Subscribers

Will do us a favor by sending postal card notice when the magazine fails to reach them. The newspaper mails are heavily burdened and consequently slighted by over-worked post-office clerks, and often go astray. We will always send duplicate copies.

STONE and MINING MACHINERY.

Stamp Mills,
Concentrating Machinery,
Smelting Machinery,
Lixivating Machinery,
Cyanide Machinery,
Rock Breakers,
Engines and Boilers.

Traveling Cranes,
Derricks,
Derrick Towers,
Planers,
Lathes,
Wire Rope and Fittings,
Rubbing Beds.

Manufactured by

H. H. SCOVILLE & CO.,

CHICAGO,
250-252-254 South Clinton Street.

TELEPHONE MAIN 4805.

LINCOLN IRON WORKS

Manufacturers of

Machinery

For Working and Handling

Stone and Marble

RUTLAND, VT.

Arithmetic for Stone Dealers.

Calculations Made Easy,
Errors Avoided,
Time and Labor Saved by

Ropp's
COMMERCIAL
CALCULATOR.

The most useful, complete and *practical* work on Figures ever published. Specially useful to stone, marble, granite and slate dealers and quarrymen. Nearly every problem in business *already figured out.* Arithmetic made so plain by *original*, short and simple methods, that a child can comprehend it. Worth its weight in gold to young and old. Nearly half a million copies sold. Accompanied by account book, silicate slate, pocket, etc. Bound in elegant leather, pocket size. Address

THE D. H. RANCK PUB. CO., 358 Dearborn St., Chicago.

Sent by Mail on Receipt of Price, $1.

Covington, Ky.—Gen. John C. Underwood superintendent and secretary of the Confederate Memorial Association has located offices here. All communications on the subject of Memorial Institute edifice should be addressed to him. An additional $100.00. to that contributed by Charles B. Rouss of New York, is to be raised at once. Desperate effort is to be exerted January 19, the birthday of Gen. Robert E. Lee, to complete the fund.

Albany, N. Y.—The new Union Station at Boston which is to be built shortly is to cost $10,000,000, and is to be the finest station in the world.

Camden, N. J.—Rapid Stone Saw Company, to make, purchase and sell stone sawing machinery; capital, $50,000. Edwin Preston, of Merchantville, is one of the incorporators.

Waterville, Me.—The Waterville Granite Company has been incorporated with Horace Purinton, of Waterville, president; I. S. Bangs, of Waterville, treasurer, for the purpose of quarrying and manufacturing granite, stone, marble, etc. Capital stock, $10,000.

St. Louis, Mo.—H. Marquardt Marble and Granite Company has been incorporated by Henry Marquardt, Sr., E. H. Rottman, A. H. Frereck and others. Capital stock, $10,000.

Albany, N. Y.- The Granite Building Company, of Rochester, has just been incorporated with a capital stock of $1,000,000, to erect buildings. The directors are Rufus A. Sibley, A. H. Lindsay, Thomas S. Johnson, A. J. Towerson and T. B. Ryder, of Rochester.

Fredericksburg, Va.— The Granite Polishing Works of York & Swift, of the Battlefield Granite Association, was destroyed by fire Jan. 4. New machinery will be required.

Bangor, Me.- Fire caused a loss of $3,000 to the Maine and New Brunswick Red Granite Company by the destruction of their building here. Loss on machinery is estimated at $1,000.

The Carbon Slate Company of Slatington, Pa., shipped during the year 1890, 32,000 squares of roofing slate, or 569 cars; also 78,000 square feet of slate blackboards, or 155 cars. Of this amount there were made to Europe during the year 11 shipments aggregating 22,000 squares of roofing slate or 390 cars.

Hawley's Patent Sand Feed

Is used by all the leading firms—saws faster and better than any other sand-feed. More gangs using our feed than any other. Easily kept in order. Also many gangs working satisfactorily, using crushed steel. Can give best of references.

Orders solicited.

E. J. & C. H. HAWLEY MANCHESTER, VT.

QUARRY PUMPS.

CHEAPEST. HANDIEST. SIMPLEST. | PUMPS.

Handling Dirty, Gritty and Sandy Liquids, without Wear, Oil or Care. Pumping outfits for Contractors, Mining, Irrigating, Railroad, Quarry, Drainage and Manufacturing purposes. Second-hand Engines, Boilers, Pumps, and other Machinery always on hand. Exchanging.

MASLINS, 165-167 First St., Jersey City, N.J.

The Publishers' Printing Co.

327 Dearborn Street
CHICAGO

Do all
Kinds of

Book and Job Printing

Half-tone work
a specialty

☞"Send thirty cents in stamps or cash and get a beautifully illustrated Souvenir of "Western Yachts and Yachting."

50 pp. Illustrations
50 pp. Descriptive Matter

HOISTING MACHINERY FOR QUARRYING,

Mining, Coal Handling, Pile Driving, Bridge Building, Log Hauling, and for General Contractors' Use.

Send for **Illustrated Catalogue** giving full description, etc.

CORRESPONDENCE SOLICITED.

W. A. CROOK & BRO'S CO.,

117-123 Poinier Street.

Newark, N. J.

Salesrooms, 143 LIBERTY ST. NEW YORK

Improved Electric Hoists, single and double, Patent Friction Drum, compound, geared with brakes and reversible for general Hoisting, Mining Purposes and Suspension Cableways . . .

Derricks and Hoisting Machines

FOR QUARRYMEN AND CONTRACTORS.

SEND FOR CATALOGUE.

Steam Hoisting Engines.
Horse Power Hoisters.
Hand Power Hoisters.
Derricks
Derrick Irons.
Sheaves and Tackle Blocks.
Rooter Plows.
Centrifugal Pumps.

DOBBIE, STUART & CO.

NIAGARA FALLS, N. Y.

NEW YORK OFFICE:—44 Dey St.

SLATE AND STONE PLANER

HORIZONTAL CABLE WAY

SLATE SAW MACHINES

Write for Catalogue.

S. FLORY & CO.,

MANUFACTURERS OF

Stationary and Hoisting Engines,

Slate Saws, Planers, Dump Cars, Slate-Dressing Machines and Cable Carriages.

Portable Hoists with Boiler and Fixtures on same base, for Contractors' use, etc.

Estimates furnished on Contracts for Erecting Plants on the Cable System—Incline or Horizontal.

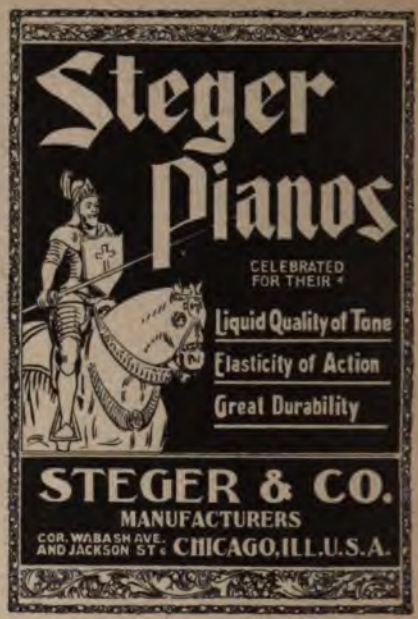
Correspondence Solicited

BANGOR, PA.

The Grant monument at New York is at last completed and will be dedicated in April next.

The report of the Commissioner of Labor A. H. Wood, of Tennessee, has just been completed. Some few facts obtained from it, relative to Knoxville marble production, etc., will be gratifying when the decrease in building interests is considered. This industry has grown to great proportions in the last few years and now ranks in importance next to the coal and iron industry. The Commissioner's report shows that 200,635 cubic feet of marble were quarried in 1896, which is the largest production in the history of the industry, with the exception of that of 1894, when 241,956 cubic feet were produced.

The parties interested believe that the production of last year will even break the record of 1894, since the quarrying methods have been improved, as have transportation facilities, and markets of the country are open and anxious for the Tennessee stone. The obstacles incidental to the early stages of the industry have been overcome, the interests have been concentrated, and the quarrying and milling is carried on by well-managed companies and corporations, with ample capital, who have in their employ skilled labor. It has passed its experimental stage and assuming large proportions, promises to be one of the leading industries of Tennessee. There has been a very marked change in the bast few years in the kind and quality of marble produced. Formerly the entire product came from Hawkins county and was of the dark variegated variety. Now the rival centers of the industry are Blount and Knox counties, Hawkins county no longer being considered the important producers. The stone is almost entirely of the lighter tints. The principal markets for Tennessee marble are New York, Chicago, and other northern and eastern cities, where it is generally used in interior work, being highly prized to produce artistic architectural effects. However, the precentage used for building purposes is increasing yearly. The marble deposits have an areal extent of over 2,000 square miles in various grades and colors, and the quarrying and milling gives employment to nearly 1,000 men.

The Cleveland Stone company predicts a revival of the stone business this year, and so say we all of us.

AGENTS WANTED For the most valuable contribution to the literature of the world since the production of the Bible. The Great Work of the Great Thinkers, Famous Orators, Renowned Scholars, Wise Writers and **INVESTIGATORS** of the 19th Century.

In all the range of literature there is not another book like

THE PEOPLE'S BIBLE HISTORY

In this book alone can be found the information sought by every Bible reader, whether old or young, scholarly or unlettered. It is, indeed, a great work.

Recent discoveries in archæology have brought the world of today face to face with the men who lived, and acted, and wrote during the early periods covered by Biblical Historians. These discoveries have resulted in the triumphant vindication of the sacred volume from the charges brought against it by open foes and pretended friends. Every intelligent person will order the book, as the matter contained in it is of vital importance and cannot be found in any other book on earth.

Write for descriptive and beautifully illustrated pamphlet circular. Address

THE HENRY O. SHEPARD CO.
212-214 Monroe St. CHICAGO.

Double and Single Head Stone Planers a Specialty.

Gang Saws.

Rubbing Beds, Etc.

F. R. PATCH MFG. CO.

Send for Catalogue B.
Mention STONE.

RUTLAND, VERMONT, U. S. A.

It cost William Wilkins of Bay, City, Mich., $20 to write his name four times on the Washington monument. Wilkins had just landed in Washington and thought it would be a good joke to register at the Washington monument instead of a hotel. He accordingly wrote his name in large letters on each of the four sides of the monument. He was arrested and tried in the police court. The judge told him that the monument was not an autograph album and that there were other ways of announcing his arrival in the capital. He told him, in fact, that the only time his name should appear on a monument was after his death. William paid a fine of $20 and remarked that his autographs had never come so high before.

It is proposed to erect a statue of Major L'Enfant in Washington, the French engineer who laid out the ground plan of that city. Washington itself seems a sufficient monument, as one of the most beautiful capitals in the world, to the skill and taste of the Frecnh engineer.

Jacob Crosthwait, of Harrison county Kentucky, who died recently, in his will directs the erection of a silver monument base, with "Free Silver at 16 to 1" inscribed on it.

The stone quarry people at Bedford, Ind., report a favorable prospect for business next season.

M. Thome began life as a journeyman stonemason, and has just died in Paris, leaving a fortune of 50,000,000 francs.

Brooklyn is to have an equestrian statue of Washington to cost $35,000. It is to be hoped that a sculptor will be selected who will give the city a really horsey horse. Many equestrian statues would be all right if it was not for the horse, says a daily paper.

The fourth annual banquet of the Barre granite manufacturing association was held at the Pavilion, Montpelier, Vt., Jan. 20. About 150 were in attendance. H. K. Bush, vice president of the association, acted as toastmaster. Responses to toasts were made by Mayor Stratton of Montpelier, Mayor Gordon of Barre, ex-Mayor E. L. Smith of Barre, John W. McDonald, T. W. Eagan, Rev. E. W. Cummings, E. M. Tayntor, A. Anderson, G. C. Mackie, Eugene Sullivan, C. N. Field, James McKay, F. G. Howland, J. L. Clark, R C. Bowers.

WILLIAMSPORT WIRE ROPE CO.
MANUFACTURERS OF
Iron, Steel and Galvanized
WIRE ROPE
HOISTING AND HAULAGE ROPES
A SPECIALTY.
WILLIAMSPORT, PA.
Correspondence Solicited.

50 YEARS' EXPERIENCE.
PATENTS
TRADE MARKS,
DESIGNS,
COPYRIGHTS &c.
Anyone sending a sketch and description may quickly ascertain, free, whether an invention is probably patentable. Communications strictly confidential. Oldest agency for securing patents in America. We have a Washington office. Patents taken through Munn & Co. receive special notice in the
SCIENTIFIC AMERICAN,
beautifully illustrated, largest circulation of any scientific journal, weekly, terms $3.00 a year; $1.50 six months. Specimen copies and HAND BOOK ON PATENTS sent free. Address
MUNN & CO.,
361 Broadway, New York.

N. W. GODFREY,
Miner and Shipper of Silica,
Washed and Screened.
THOMAS & ECKERSON, AGENTS.
New York Office, 33 and 35 West Thirtieth Street.

VANDUZEN STEAM JET PUMP
THE BEST IN THE WORLD.
Pumps Any Kind of Liquid.
Always in Order, never Clogs nor freezes. Every Pump Guaranteed.
10 SIZES.
200 to 12000 Gallons per Hour.
Cost $7 to $75 each. Address
THE E. W. VANDUZEN CO.,
102 to 108 E. Second St., Cincinnati, O.

WANTED! WANTED! WANTED!

1,000 Customers wanted to use

HARRISON BROTHERS'

CELEBRATED....

Diamond Grit Chilled Shot or Iron Sand

for very fast sawing and polishing of Granite, Marble, Onyx, Glass, etc.

HARRISON BROTHERS
FOR
SAWING AND RUBBING
FREESTONE
GRANITE
AND
MARBLE
DIAMOND GRIT

There are many imitations on the market, but *Diamond Grit* leads them all in Europe, Australia, Canada and the United States.

Write for samples and prices to one of the firm, and head representative of the United States and Canada.

NATHAN C. HARRISON,
63 Savin St., Roxbury District,
BOSTON, MASS.

Agents Required for Vermont.

$150 CASH, and **$200** in finished Granite Monument, or Dimension Stone,

will take in exchange a

$400 New Piano

One of the most popular and highest grade instruments made. Still in wareroom. Address

TRADER, care STONE.

The Pulsometer Steam Pump.

The Handiest, Simplest and Most Economical Steam Pump for General Quarrying and Contractors' Purposes.

Used and Highly Recommended by Quarry and Mine Owners and General Contractors.

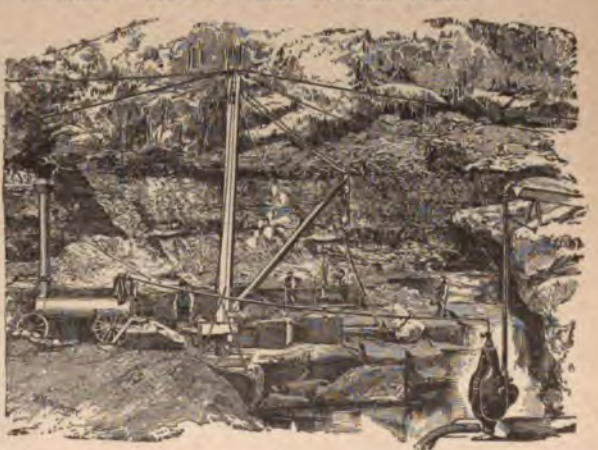
RECENT PRACTICAL IMPROVEMENTS.

MUDDY OR GRITTY LIQUIDS HANDLED WITHOUT WEAR TO THE PUMP.

Descriptive Catalogue and estimate on Complete Pumping Outfit, if desired, furnished on application.

Pulsometer Steam Pump Co.,
13 Greenwich St., New York.

REPRESENTED AND STOCK CARRIED BY
CHAS W. MELCHER MACHINERY CO.,
ST. LOUIS, MO.
PARKER, MELCHER & INGRAHAM (Inc.),
CHICAGO, ILL.
INGERSOLL-SERGEANT DRILL CO.,
CLEVELAND OHIO.



Bedford, Ind.—The jury in the Clelland case at Bloomington for damages returned a special verdict, Jan. 4, for the plaintiff in the sum of $650. The plaintiff was injured while in the employ of the Chicago and Bloomington Stone Company by a defective crowbar breaking when he was attempting to move a channeling machine with it.

San Bernardino, Cal.—San Bernardino Artificial Stone and Improvement Company, reported to have given judgment for $589.

Golden, Ill.—Thomas & Rhea, marble, J. B. Thomas gave warranty deed for $675.

Decatur, Ill.—Nelson F. Brown, monuments, gave deed for $10,000.

Bloomington, Ind.—Dr. Linsey T. Lowder has filed proceedings in the Monroe Circuit Court for damages to the extent of $27,000 against the Crafton Stone Co. and John B Carfton. In the complaint plaintiff avers he was owner in fee simple of certain real estate situated in Monroe county in July 1895, $10,000 worth of which he transferred to the defendant company, on certain representations regarding this stock, which representations he claims have since proved to be false.

Bluffton, Ind.—Karns & Kapp, marble, gave chattle mortgage for $1,000.

Duluth, Minn.—Francis Omeis & Co., assigned.

Ashland, Wis.—Kepler & Dumez, stone quarrymen, reported to have given judgment for $823.

Saugerties, N. Y.—Burnhaus & Brainard, wholesale bluestone, reported to have given judgment for $169.

Dallas, Tex.—Irwin & Guthrie executod a deed of trust Jan. 2, to E. H. Sabin, for the benefit of their creditors. Claims amount to $1,600.

New York City.—Judgments were entered here Jan. 8, against Light & Louther, dealers in stone at 462 East One-Hundred and Seventh street as indorsers on a note of Nora S. Smith, for $6,151.

Perry, Ia.—C. E. Boice has bought the marble business of Harry Miller.

The Joyce-Cridland Co.

Dayton, O.

Manufacturers of

Patent Lever, Compound Lever, Screw and Hydraulic

JACKS

for Stone-Yard Use.

Illustrated catalogue free.

SPIRAL

Sand Pump

For Feeding Sand, Steel or Shot for

SAWING STONE.

Of all Kinds. Does More Sawing, Uses Less Sand and Water, Requires Less Power and Repairs than any other. Runs only 20 revolutions per minute Pays for itself in Six Months.

FRENIER & LeBLANC, Rutland, Vt.

Stone and Marble Cutters' Mallets

J. B. HELLENBERG,
Coldwater, Mich.

Our mallets are giving splendid satisfaction on all kinds of Stone and Marble. Strictly first-class second growth hickory. Write us for prices, etc.

Try

ASHBURTON MARBLE

As a Decorative Material.

COLOR:

Dark grayish purple ground, interlaced with a net work of red and white veins.

CAN BE OBTAINED IN BLOCKS OF LARGE SIZE.
TAKES A BEAUTIFUL POLISH.

It is quarried in Devonshire and shipped F. O. B. Bristol, by

ARTHUR LEE & BROS., LTD.,

Marble and Granite Merchants ....

BRISTOL, - - ENGLAND.

Richmond, Ky.—George O. Dozier, proprietor of the Madison Monumental Works, assigned Jan. 1, to D. P. Armer. Liabilities $500; assets $500.

Joliet, Ill.—The Joliet Limestone Company recently certified to the decrease of its capital stock, from $1,500,000 to $600,000 and to the change of the principal office to Chicago.

Cleveland, O.—A $40,000 mortgage was executed by the Globe Stone Company of Chagrin Falls, Jan. 5, to the Cleveland Trust Company to cover an issue of bonds by the stone company.

Philadelphia, Pa.—John A. Friel and William F. Friel, trading as John A. Friel & Son, marble cutters, have made an assignment for the benefit of creditors to Barzillia Ridgway. The deed is dated December 30, 1896.

Scranton, Pa.—The Midvale Slate Company, whose quarry is at Wind Gap, has made an assignment with liabilities of about $14,000. W. A. Winsboro, who left for parts unknown about a month ago, was manager of the company, and at the same time managed the Acme Slate Company, both of which have made assignments.

Stone City, Ia.—J. A. Green, quarryman, has filed a suit against the Davenport and Rock Island Bridge, Railroad & Terminal Company. He wants $1,991 to balance the account for stone furnished. The suit takes the form of a mechanic's lien.

Milwaukee, Wis.—The Berlin & Montello Granite Company of Chicago, Jan. 4, securpa udgment against William Forrestal, for $6,057.-01, The claim was based on a consignment of stone delivered last November and not paid for The judgment was obtained by default.

Milwaukee, Wis.—Under-sheriff Armour, Jan. 8, sold 500 shares of the capital stock of the Wankesha Stone Company at the courthouse, to satisfy an execution in favor of Robert Nunnemacher, against Oscar Knie. The stock was bid in for $100 by J. B. Le Saulnier. Under-sheriff Armour states that it will be nearly two months before he disposes of the matters he has in hand and until that time it will be necessary that he retain possession of the books.

THE ACCIDENTS OF LIFE

THE STAR ACCIDENT COMPANY

Write to T. S. QUINCEY, Drawer 156, Chicago, Secretary of the Star Accident Company, for information regarding Accident Insurance. Mention this paper. By so doing you can save membership fee. Has paid over $600,000.00 for accidental injuries.

Be your own Agent.

NO MEDICAL EXAMINATION REQUIRED.

I SEE YOU'RE BACK

from a trip over the

MONON ROUTE

Solid vestibuled trains Daily, heated by steam, illuminated by Pintsch light,

BETWEEN

CHICAGO
INDIAN'POLIS
CINCINNATI
LOUISVILLE
And the SOUTH.

Only line to

West Baden and French Lick Springs,

The Carlsbad of America.

W. H. McDoel, V. P. and Gen. Mgr. Frank J. Reed, Gen. Pass. Agt.

City Ticket Office, 232 CLARK STREET, CHICAGO.

THE NEW YORK
PUBLIC LIBRARY
ASTOR, LENOX AND
TILDEN FOUNDATIONS

From the wall painting in the Hotel De Ville, Paris.

TEXTILE DECORATION.

By P. V. Galland.

Reprint from *The Architect*, London.

STONE

VOLUME XIV. [illegible] NUMBER 1.

*INSTRUCTION IN ARCHITECTURAL DRAWING.—IV.

[illegible]

THESE exercises in Tracing, Copying, Original Composition and Graphical Discussion, executed on the right half of the page, occupy rather more than half the time given to drawing during the first year, three or four hours in the morning being devoted to them every week, and three hours in the afternoon every alternate week. One afternoon a week is given to them in the second year, and in the third year an hour or two a week is given to pen drawing. The historical drawing, done in the second and third years in connection with the work of Historical Research which occupies the third part of the spring, suffices to keep up and further to perfect the skill thus acquired.

The afternoons of the alternate weeks during the first year are given to Brush Work with India ink and colors, the intermediate weeks, as has just been said, being given to Pencil Work. These exercises amount to a dozen or twenty in number, being about one for each week devoted to them, and are arranged so as to give a considerable variety of practice in the rendering of plans, elevations and details. The series of exercises for the last year was as follows:

1. Practice Sheet of India Ink Washes.
2. Large Porch with Steps, from Durand, in color, with the shadows cast.
3. Elevation from Scheult's *Recueil d' Architecture*. This is a collection of Italian villas, farm-houses, barns, granaries, fountains, etc., drawn in outline with an indication of background and foreground. They measure only three or four inches, but are enlarged by the students to twice or thrice their original dimensions, the shadows cast, and walls, roofs, sky, trees, hills and foreground put in in colors, each pupil taking a different example. (Plate XVII.)
4. The Tomb of Scipio Barbatus, rendered in India Ink.
5. A Modern Cottage.

*Original in *School of Mines Quarterly*. Revised copy furnished [illegible] by author.

From the wall painting in the House of Vine Pace

TEXTILE DECORATION.

By W. R. Lethaby

Reprint from *The Architect*, London.

STONE

VOLUME XIV. MARCH, 1897. NUMBER 4.

*INSTRUCTION IN ARCHITECTURAL DRAWING.—IV.

V. BRUSH WORK.

THESE exercises in Tracing, Copying, Graphical Construction and Graphical Discussion, executed for the most part with the pencil or pen, occupy rather more than half the time given to drawing during the first year, three or four hours in the morning being devoted to them every week, and three hours in the afternoon every alternate week. One afternoon a week is given to them in the second year, and in the third year an hour or two a week is given to pen drawing. The historical drawing, done in the second and third years, in illustration of the work of Historical Research which occupies the chief part of the spring, suffices to keep up and further to perfect the skill thus acquired.

The afternoons of the alternate weeks during the first year are given to Brush Work with India ink and colors, the intermediate weeks, as has just been said, being given to Pencil Work. These exercises amount to a dozen or twenty in number, being about one for each week devoted to them, and are arranged so as to give a considerable variety of practice in the rendering of plans, elevations and details. The series of exercises for the last year was as follows:

1. Practice Sheet of India Ink Washes.
2. Large Porch with Steps, from Durand, in color, with the shadows cast.
3. Elevation from Scheult's *Recueil d' Architecture*. This is a collection of Italian villas, farm-houses, houses, granaries, fountains, etc., drawn in outline with an indication of background and foreground. They measure only three or four inches, but are enlarged by the students to twice or thrice their original dimensions, the shadows cast, and walls, roofs, sky, trees, hills and foreground put in in colors, each pupil taking a different example. (Plate XVII.)
4. The Tomb of Scipio Barbatus, rendered in India Ink.
5. A Modern Cottage.

*Original in *School of Mines Quarterly*. Revised copy furnished STONE by author.

PLATE III.—BRUSH-WORK FROM PHOTOGRAPH AND FROM DRAWING, THE OUTLINES TRANSFBRRED BY TRACING, AND REDUCED IN SCALE BY SQUARING. R. A. McC., S. G. S. (About two-thirds the dimensions of the originals).

This serves to explain constructions in wood. Plans, sections and details are traced from a diagram, and then re-drawn to a different scale and rendered in color.

6. A Stone Portico.

This is a similar exercise for constructions in stone.

7. A Tower. Elevation and Perspective.

This subject is given in plan and elevation by a diagram, drawn out by each student from his own sketch, with the aid of a little elementary instruction in perspective, and rendered in color.

8. A Figure in Flat Washes.

This is an exercise in drawing sculpture as it needs to be drawn in connection with architecture. A figure is traced from a print or photograph, the main line dividing the light side from the dark side is found, and the dark side shaded with a single flat tint. The figure is then reduced in size several times by the method of squaring, until the smallest drawing is about as large as the figures of statues introduced into drawings of buildings. Each student draws a different figure. (Plate III.)

9. Another example from Scheult, with the plan and ornamental grounds added. (A side elevation, also, such as may easily be inferred from the other, is sometimes required).

10. The Tuscan Order, at a two inch scale.

11. The Doric Order, at a one-inch scale, applied to a doorway. (Plate XVIII.)

12. The Ionic Order, at a three-inch scale.

13. The Corinthian Order.

The class had not yet learned their orders, and these plates were made merely as drawing exercises. But they had by this time learned their Shades and Shadows, and the shadows were accurately cast, rendered in India ink, and the plates colored.

14. A large plan, with gardens, rendered in color.

15. A large elevation, rendered in color with the shadows cast.

By this time the class had learned their orders.

The exercises in historical drawing which occur in the last half of the second and third years afford opportunity for further practice with the brush both with color and with India ink, and this is made the most of. But of course the chief application and development of the skill attained by the elementary exercises of the first year is found in the rendering of the plans, elevations and details, the study and designing of which is the chief work of the second, third and fourth year.

In the fourth year also, the class have regular instruction and practice in water colors, and in the drawing and rendering of architectural perspectives. The skill thus gained is turned to account in rendering ornament with the brush, instead, as before, with pencil, pen and charcoal.

It is an interesting variation of these exercises to copy in water colors

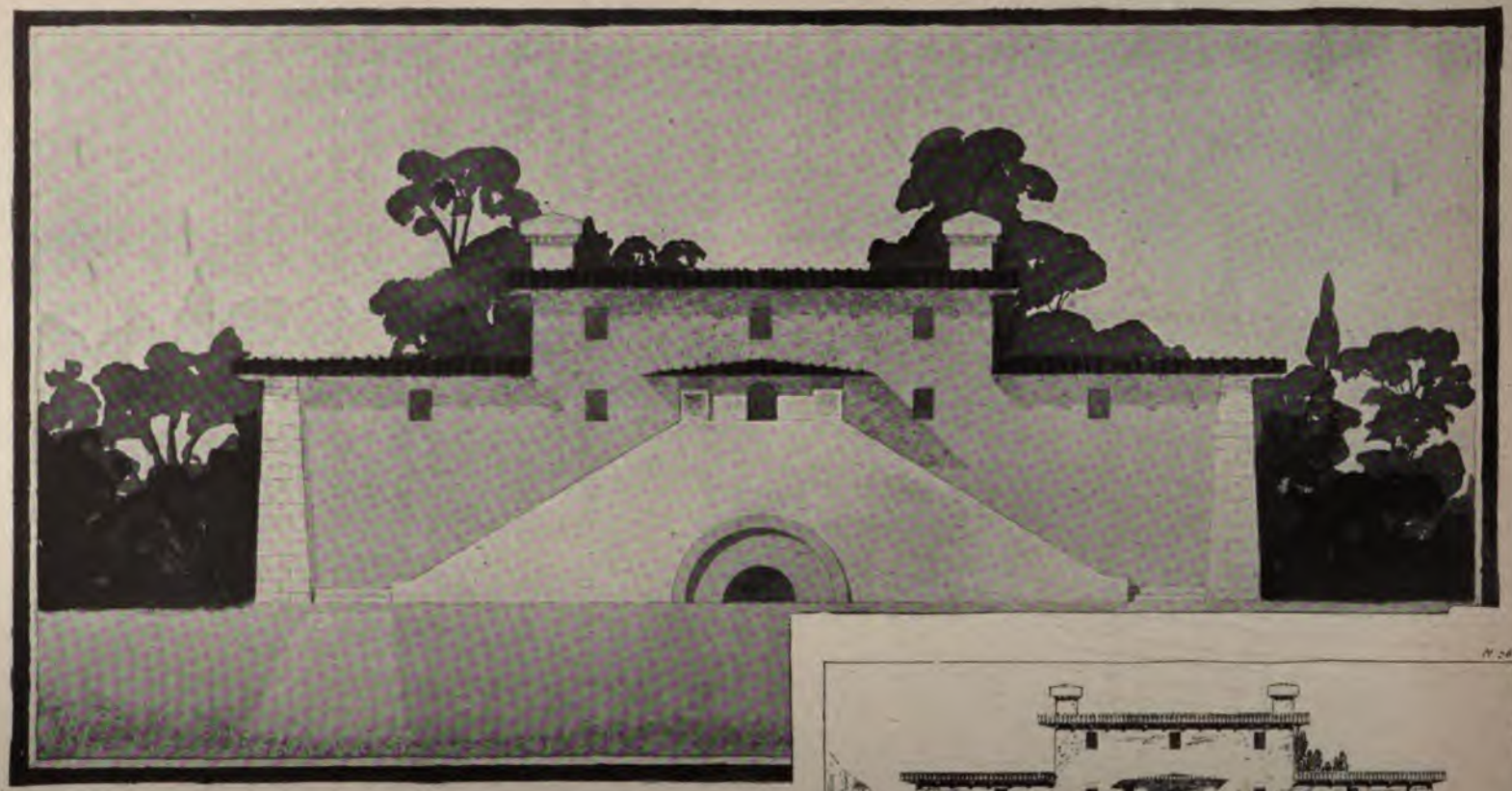


PLATE XVII.—FROM SCHEULT'S RECUEIL. ENLARGED AND COLORED. H. C.

(First Year).

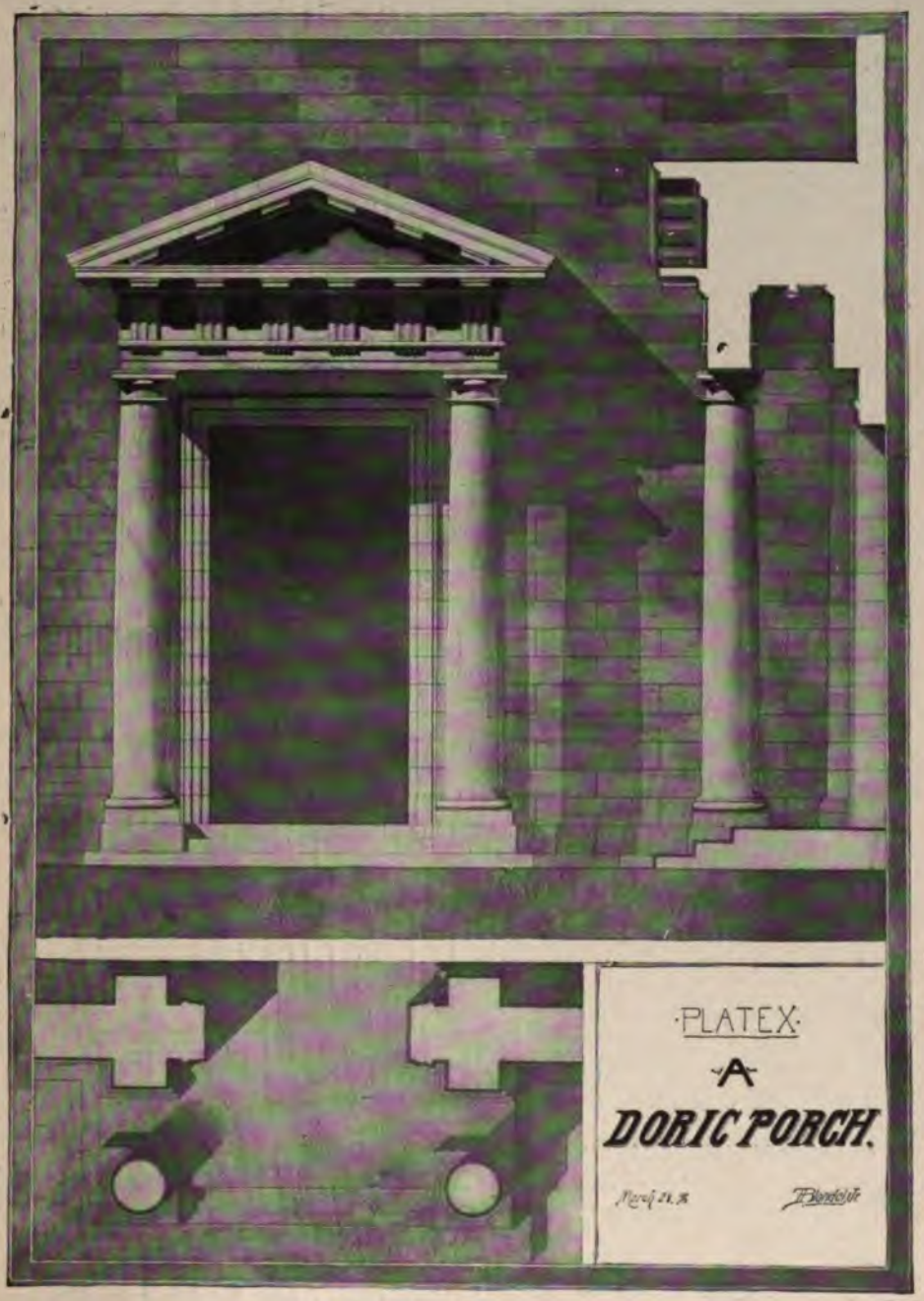
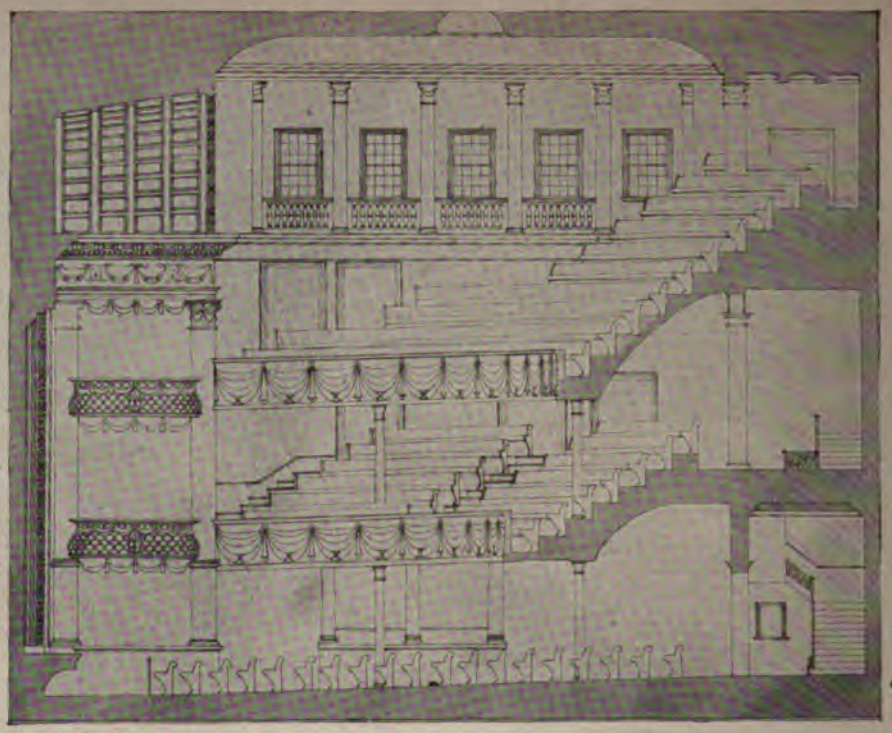


PLATE XVIII.—A DORIC PORCH.



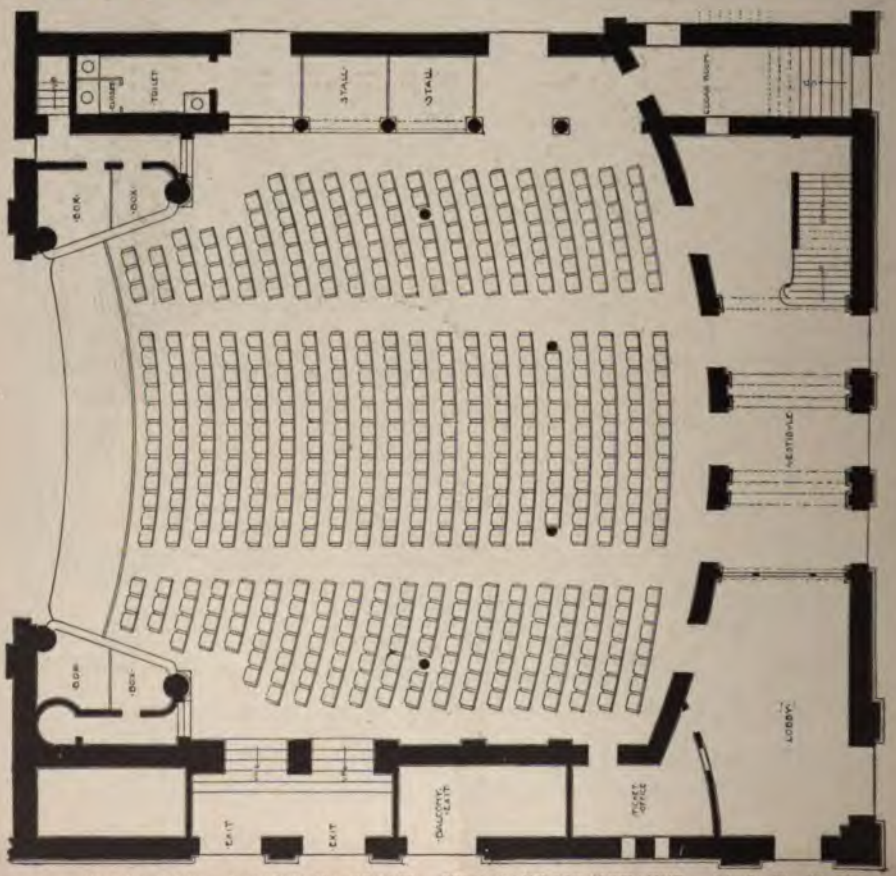
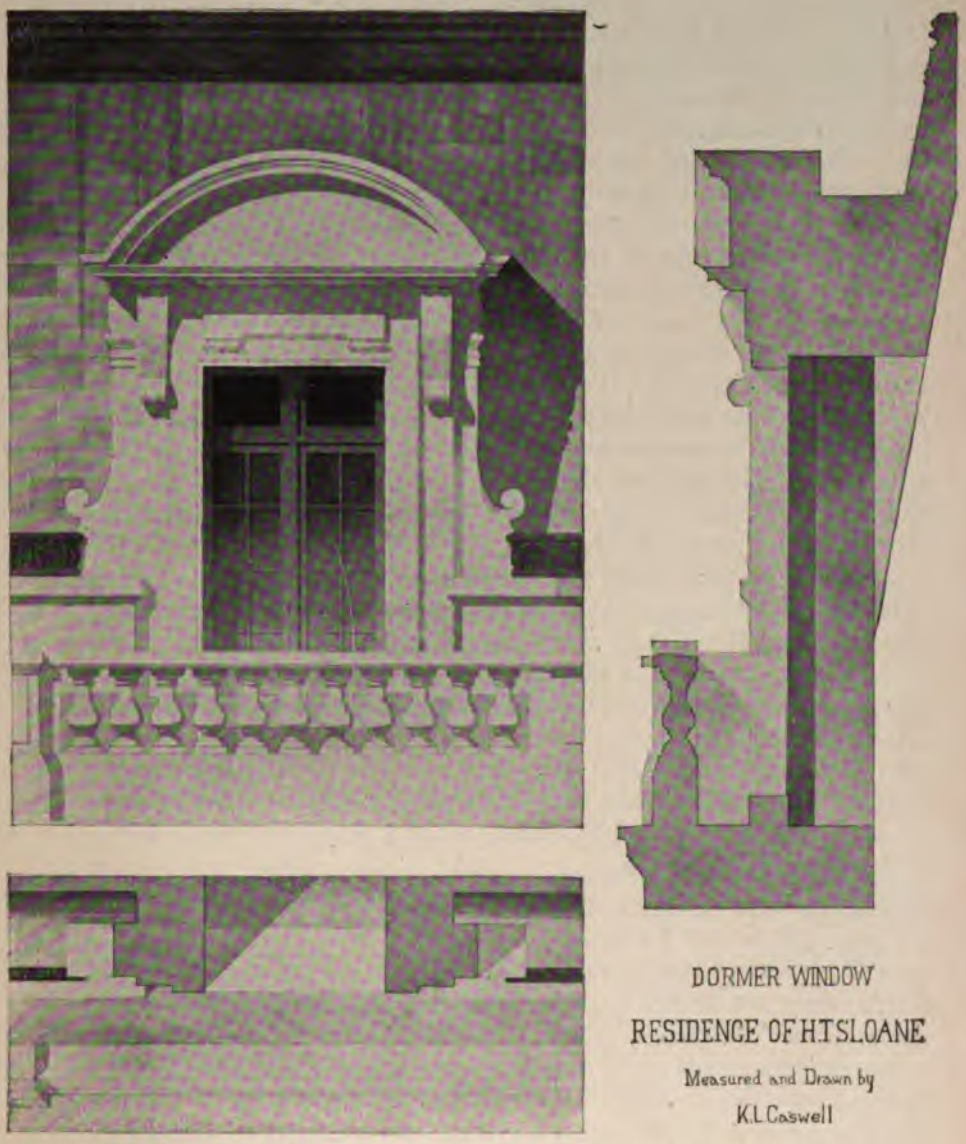


PLATE XIX.—MEASURED WORK. THE GARDEN THEATER. H. S. H., H. H.



DORMER WINDOW

RESIDENCE OF H.T.SLOANE.

Measured and Drawn by

K.L.Caswell

PLATE XX.—MEASURED WORK. (Second Year).

a picture painted in oils, or to copy a photograph or engraving, imitating the handling and coloring of a water-color drawing of similar character, as is done in the plates from Scheult. (Plate XVII.) The inverse process, that of copying in India ink or sepia, or with the pencil or pen, drawings or paintings in color, is even more instructive, since it involves a solution of the difficult problem of rendering the relations of colors, and their *values*, by means of black, white and gray. All these exercises tax to the utmost the student's judgment and skill, and often bear witness in the result to interesting diversities of personal predilection. Like the drawings made in copying photographs or lithographs, these are exercises rather of translation and interpretation than of direct imitation, and like them are a capital preparation for drawing from nature.

These works of various draughtsmanship illustrate, indeed, in a marked degree, the principle which guides and governs all the work of the school, in every branch of study, the principle of defining the student's work within strict limits, so as to make sure that he traverses every portion of the ground that he is required to go over, but within those limits not only permitting, but obliging him to think for himself, try his own experiments and trust to his own wits in shaping his answer to the questions that present themselves. Even in the Mathematics and Mechanics every fresh point is presented by preference as a problem to be solved rather than as a theorem to be demonstrated. As was said of the historical problems described in a previous paper, if the student can find an answer for himself he had better do so. If he cannot, the attempt makes the answer more intelligible and more welcome when it is told him. So in this work with pen, pencil and brush the student is shown just what he is to do, and the principles he is to follow are explained to him. But in the application of them he is left largely to his own devices.

VI. OUTDOOR SKETCHING.

All the men in the three upper classes study buildings in the city and make from them measured sketches during the first four or five weeks of the year. This is of great service in helping them to understand and feel the relations that exist between drawings and the things they represent. Similar exercises form a portion of the work required to be done during the three summer vacations.

In the prosecution of this work two squads, of about twenty men each, last year attacked the City Hall and Trinity Church and, by the favor of the Mayor and of the Wardens, were enabled to make fairly complete drawings of both those buildings. This year a still larger number of men, organized in squads of three, each under the captaincy of a fourth-year man, made measured drawings of a large number of buildings and parts of buildings, public and private, a work for which their owners kindly offered every facility. (Plates XIX and XX.),

Prof. William R. Ware.

[TO BE CONTINUED.]

ART AND ARCHITECTURE.

TWO QUESTIONS CONSIDERED { *First—Is Architecture a Living Art?* / *Second—Can Architecture Again Become a Living Art?*

ARCHITECTURE in its quality of an art is one of the chief factors which make up cultural history, and no question concerning it can be considered except in that light. A satisfactory, even a fair solution of the above questions can, therefore, not be given except by first turning our view backward on the material at hand, and try to furnish, though in the briefest manner, a kind of historic sketch.

Primitive man has this feature, in common with a number of species among the higher animals, that he is fond of adornment. But with man only does this character ascend beyond sexual relations. He soon loved adornment for its own sake. To him it had become a moral agent. All arts originate with this characteristic feature. First, the arts of braiding, knitting, stitching, and, proceeding further, the arts of moulding clay and other earthly substances into bodily forms. And these forms take their natural growth.

When man gradually became conscious of his utter dependency on nature revealed to him in her manifold processes, he was overtaken by a profound feeling of awe—the dawn of religious sentiment. The family hearth became an altar, first for the family, later for the community. Architecture in its original dawn then came to light. Semper[2] says in this regard: "The works of architecture relate the natural history of mankind as truly as do the shells and coral reefs that of the lower organisms by whom they were built." But it seems to be fair to assume that the primary arts were developed to a conspicuous degree before an architecture worthy of the name could have been unfolded.

The temple, in all ages past, must be regarded as having been the first and foremost original object of architecture. It was developed from four elementary constituents, being: *Substructure*, *walls*, *roof* and *altar;* the latter its most essential part, the very soul of the edifice.

In primitive ages, when the art of architecture was but in its dawn, no accommodation was had, nor could it have been had, for a worshiping multitude. A *cella*, a space immediately surrounding the altar, was, it is fair to assume, the exclusive edifice of worship, rude as this may seem to have been. It afforded room for the priesthood, but

excluded the worshiping multitude. Extensions soon thereafter became a necessity, growing in importance with the gradual development of society. The cella was inclosed sideways and in frontal directions, to give dignified accommodation to rulers and their barons, and to the worshiping multitude. In all ages the temple is thus arranged.

HEBREW ARCHITECTURE.

The books of Moses[3] give a somewhat minute description of the ancient Tabernacle, which during a succession of prehistoric ages had grown to a remarkable significance. The art, though somewhat crude to our present taste, must be acknowledged as having been highly developed, so that Solomon was not allowed to make any changes or remarkable improvements thereon, when he constructed his great temple. He merely doubled dimensions, converted the tent character of the Tabernacle into solid form and, probably, added richness to the details. There are no remnants left of the temple and we are unable to judge of the true character of its fashion and its details. However, it would seem certain that at present no disciple of architecture who perchance is bent on copying what he can find of ancient forms, will be seriously glad to do so with what Solomon's temple could have furnished him.

History has no data which permit us to judge of the growth of primitive forms into those possessed by the Tabernacle. We, therefore, cannot decide as to whether or not it had been *indigenous*. But the temple of Solomon may be said to have been a work of *living architecture*, inasmuch as it must be assumed that the heart and soul of the nation were connected with it.

EGYPTIAN ARCHITECTURE.

Egyptian architecture may be said to be especially the outgrowth of the country, which is very unique and positive in natural extent and surroundings. It is, we must keep in mind, a long and narrow valley within an absolute desert, dependent solely on the fluctuating processes of a large river. Settled in times immemorial, its history begins as early as four thousand years prior to our era, when one ruler had succeeded in establishing himself over all the different tribes. Its entire territory scarcely exceeds that of our home state, though in Moses' time it was inhabited by more than eight millions of people.[4] The country steps into existence, as it were, with the highest degree of culture, nowhere exceeded in the course of its history.[5] Originally, as it would appear, there was thought to exist over the country one all-overshadowing Deity having a seat above the clouds. But in the course of events, as they moulded themselves under despotic reign, especially under such as were managed by a crafty priesthood, singular deities, at first nothing but mere special emblems of the one original Deity, were evolved and established in different parishes, under specific names and endowed with

various powers. The late Professor Brugsch[6] had undertaken the difficult task of giving the world a clear insight into the specific offices filled by those various tribes. But his success is kept in doubt. A few main features of some of the offices of a limited number of these deities are, and have been in a measure, clear to understanding, but upon the whole the *Egyptia Olympus* remains in the dark.

But the professor was a great explorer of Egyptian history. He reports the finding of a number of tablets with inscriptions made by a prince of the third dynasty, wherein said prince speaks of the one great orignal Deity above mentioned and gives the number of *forty-two moral commandments*, or denials, as often called, for the conduct of man. Nobody can read this bill without a feeling of profound awe stealing over him. One is carried back to an era two thousand years prior to that of Moses. Are our ten commandments but a fractional copy of the ones inscribed by the Pharaonic prince? It is known that Moses had been a pupil of the priesthood, who, most likely, had acquaintance with all the forty-two commandments of the prince, or at least with a fractional part of them. Brugsch himself raises the question.

It seems to be a fact that Egypt, from the time of its consolidation to that of the Shepherd Kings, so called, did enjoy comparative peace. Follow the four hundred years under these rulers, whom Virchow declares, from examination of their skulls, to have been Turks, and subsequently, upon their expulsion, the new empire. All rules and regulations made and formed under the ancient empire, by kings and priests, were rigid and severe. No deviation was allowed, under penalty of death, as demonstrated in a number of wall paintings.

A standstill, if not actual retrocession accompanies the reign of the Shepherd Kings. But their expulsion inaugurates a new era, the greatest in Egyptian history, which also inaugurates the liveliest era in the line of art. Follow decline and internal strife, till once more a successful ruler establishes power and consequent revival of art. Then follow rhe Persian conquest full of pernicious strife; thereupon the conquest of Alexander and the glorious period of the Ptolomies. Then Roman, Mohammedan and other conquests to the present day.

The shepherds did not and could not, like any other rude tribe breaking into established civilization, whatever that might be, interfere with national forms before established. They merely added the small number of their home deities. The first real change was inaugurated by the Greeks under Alexander, who built up the city of his name on principles of their home country, elaborated into a fashion, later on adopted by the Romans. This independently evolved architecture of the Romans was by them carried into all their provinces. Egypt alone, save Alexandria, was excepted. Rever-

ence for the country's worship, however absurd this may to us appear, seems to have bidden them there to continue and observe the ancient sacred cultus, and style of architecture thereon dependent. Egyptian deities, in form of their idols, received prominent places in their great Pantheon.

The Pyramids, in all history the wonders of the world, owe their origin to a belief in the migration of souls. So did those gigantic statues found in all parts of the country.

The remnants of all temples exhibit the manner of their origin. There is, first of all, a sanctum for the priesthood and the sacred altar—the cella. At both sides and in front there is, mostly so in immense proportions, room for the nobility and for the multitude. Grand columns of specific forms carrying architraves, come in practice. They carry no roof, but they were, as Semper would believe, covered with mattings stretching over the interspaces. When finally the temple had grown to dimensions gigantic in every proportion, a further frontal extension was had, in a symbolic sense, by placing in front of the gate heavy rows of sphinxes and pylons.

The in many respects monotonous, yet profoundly interesting history of Egypt, exhibits a very long and enduring national life. It passes through a large number of centuries without any substantial gain or change. Real development, now and then attempted, is rigidly put down as revolutionary, and established faith and custom are maintained. But, nevertheless, or perhaps by dint of custom—who knows?—Egyptian architecture has evolved and given to the later world a column well developed, though not altogether graceful, and also a number of minor forms and ornaments, all as a grand nucleus for a more consummate development under the world-conquering genius of the Greeks. In this respect Egyptian architecture may well be said to have been the morning-glory to a prospective higher civilization. This architecture has been, most eminently so and in every true sense of the word, a *living architecture*. It was likewise *indigenous*, was born, I trust, on the soil of its glory, though latest discoveries would seem to cast a shadow of doubt on such a verdict.

BABYLONIC–ASSYRIAN ARCHITECTURE.

The Mesopotamian Valley was, unlike that of the Nile, from the remotest ages onward, a seat of incessant strife and change. History does not record the time when first the inclosing rivers were bound in artificial channels in order that a harvest might be assured to a valley so fertile. We merely know as a result that one tribe once settled was in time overwhelmed by another. A hardy set of people, grown up under privations in a neighboring country, would restlessly descend on the valley and exterminate the effeminate settlers who had enjoyed a life of luxury on the bottom land long enough to have lost their original vigor. When government was more firmly established, the chief or king found it necessary to establish a fortified

bourgue in stages, one above the other, but large enough for all military display. The summit was crowned with a temple of Belus which had columns headed with the first crude form of a volute capital from which the later Ionic order was derived.

When the remnants of one of these immense fortifications were first exhumed it was believed, from its extensions, that it had encompassed the entire city of ancient Nineveh. But soon after a number of similar fortifications were discovered in the immediate vicinity, and the ideal compass of the city was accordingly extended. The very Tower of Babel, in fact, seems to have been a structure of similar nature. And let us not forget the tremendous walls surrounding the great ancient city, bearing those fabulous hanging gardens of a great queen. Who has not heard, also, of the one hundred gates within those walls? A clearer light may fall upon these wondrous works when the results of latest discoveries will have come to public light, which date back to a time five thousand years remote from the beginning of our era, a time about one thousand years back from that of the first king of Egypt. And who knows but what the Tower of Babel and the gardens of Semiramis will find a place in this more remote period of history? Some eight years ago a discovery was made relating to a very early tribe called Sumarians, as one of the earliest settlers in the Mesopotamian Valley. They worshiped a god Nun, evidently the same who with the earlier Egyptian had been a kind of All-Father. An opinion at once arose that Egypt had received its first civilization from Mesopotamia, yet a certainty as to this, even a probability, is as yet seriously doubted.

Later on a new kind of Babylonian-Assyrian architecture had sprung up. Large palaces were built on level ground. These buildings abound in a number of designs of various ornaments which exhibit a positive relation to the later architecture of the Greeks, which most assuredly had been derived therefrom. Wall pilasters and the limited number of columns employed show the traces of the later Ionic columns as well as do those found among the remnants of a Belus temple.

Architecture of the Mesopotamian Valley was at its time, as must be judged from what is known, a *living art.* It was without question indigenous to the soil.

Persian architecture subsequently starting under Cyrus was, most probably, derived from Mesopotamian, Egyptian and Grecian models.

HINDU ARCHITECTURE.

Be it sufficient to note that the architecture of India started at a very early date with complicated work and a profusion of details thereon. Though the following Buddhistic period showed a lesser desire for complications, the works of architecture remain abounding in both. And this redundancy was brought to its utmost complication with the restoration of

the ancient faith. The people of Hindoostan seem to have been delighted with the incessant hard and, as it would appear to us, most tedious work done under the yoke of a priesthood. Yet all the achievements have received no higher cultural interest since they have had, as would appear, no bearing on architecture of the future. Though ever so gorgeous in form, ever so gigantic in dimensions, and difficult in execution, they deserve as works of art none of our admiration. Unquestionably the art had life during long ages and was, as we may acknowledge, born on the soil of its own country. But it stands by itself a sort of independent issue.

CHINESE AND JAPANESE ARCHITECTURE.

We are met in China and in Japan by this singular state of affairs, that the system of architecture there prevailing, even at this day, has never grown beyond what had directly arisen from the aboriginal nomadic tent. Palaces, so-called, and temples, ever so gigantic in proportions, bear testimony to this fact. They are but tents, though such on a huge scale. A column had never been developed, because sticks of bamboo, or plain round sticks of timber, have not the characteristics which are essential to a column: treatment of the shaft, and a capital. It is significant for Chinese aud Japanese architecture that it has not received even a mere mention in Wilhelm Luebke's Standard History of Architecture. The art, whatsoever it be, was unquestionably *living* in both countries, and indigenous, but it has no sort of cultural bearing. It is worthy of note that a few years since the government of Japan introduced a notable architect from Berlin, Germany.

GRECIAN ARCHITECTURE.

The general types fundamental to Grecian architecture were derived from Egypt and from Asia. This is universally acknowledged and it has been indicated under the respective heads. Under the influence of the general genius of the nation it grew in the course of centuries to absolute perfection, though before this came about the ancient faith had been somewhat undermined through the agency of science. The bosom friend of the great statesman of the age was, as is known, one of the foremost philosophers of the age. But it was not possible to disown the faith of the multitude under which the commonwealth had matured. This faith was in a sense still firm and sacred. The fable of ancient Erectheus was especially sanctified, and to the glory of the Athena Parthenos, the ideal protector of the commonwealth, the grandest sanctuary[8] was dedicated—so grand, so perfect in every particular that even at this day it is regarded with a feeling of profound reverence. Man bows before the supremacy of high art, for this art is the foremost elevating factor in cultural history. Life without the enjoyment which radiates from art would hardly be worth living. "So subtle are the forms of Grecian architecture," repeating here what I said at another place, "in direct distinction from Gothic, which rests upon a mechanical basis, that the

positive correctness and harmony of all parts of the structure must come, as it were, like a revelation to the well-trained eye of the architect, as much and perhaps more so as must the true expression of a human face reveal itself to the artist painter who undertakes to cast it upon his canvas."

That Grecian architecture had at its time a *true life* cannot very well be doubted. It was, however, not indigenous, inasmuch as it was derived from other countries.

ROMAN ARCHITECTURE.

The forms of Roman architecture were derived from those of the Greeks. What had been begun in founding Alexandria was further evolved in Rome. The arch received life, and works gigantic in dimensions and of a wholly worldly character were constructed simultaneously with many celebrated temples. Poetry in forms, as above achieved by the Greeks, was then in a manner transposed into poetry of grandeur, yet a poetry much to be admired. There was a *real life* in this architecture, but even more so than Grecian architecture, it was not indigenous.

ORIGINAL CHRISTIAN ARCHITECTURE.

A wholly new era had come over the world, for which the final rottenness of Roman and all other heathen life had paved the way. A truly democratic feeling intrinsically earnest and devout had taken possession of the human soul. Earthly life was totally negatived, and art could henceforth find no room in the soul of man. When adequate larger places of public worship were coming in demand, they were reared in a fashion of the defunct market-place, known under the name of Basilica, thus reared without reference to art, in any possible manner. Columns carrying the walls of the central nave were promiscuously taken from the ruins of ancient temples and other structures. More limited places of worship, especially in eastern countries, were fashioned in form of a roundhouse, having more or less similarity to the celebrated Pantheon, though vaulted ceilings were at first omitted. Since a love for beautifying somehow could not be wholly denied, it came to life in this instance by ornamenting the many plain wall spaces in various mosaic patterns, all of a nature contributive to religious faith. Even the windows were gradually filled with colored glass, and this gave rise to the art of glass-painting, later on so conspicuous and in a manner refined in the later cathedrals. Inasmuch as there was art at all edifices of the kind, it most unquestionably was a *living art*. But it was not indigenous.

BYZANTINE ARCHITECTURE.

With progressing time, though early enough when art in the East still had a trace of life, a very ingenious new form of roundhouse was inaugurated at Constantinople. The Hagia Sophia was erected, a wholly novel, composite form of roundhouse of grand proportions; so grand and so con-

summate in all its constituent parts that even at this late day there are men, well versed in the principles of art and architecture, who pronounce it to be the greatest architectural achievement ever consummated.[9]

There was *life* in this art for a number of centuries. But it would seem at least very doubtful whether it should be called indigenous. We should not call it so.

MOHAMMEDAN ARCHITECTURE.

A time had arrived when one-half of the Christian world had been overridden by a bigoted nation inspired with the particular doctrine of the Koran. This nation had brought with it from the wilderness of its original home ideas utterly foreign to the world. The sense of art here revels in a loose fancy, bringing to life numberless designs seemingly without motive. Yet the people were possessed of a kind of innate taste in a degree commensurate to our own, so that we can look with a sort of pleasure upon the best productions of Mohammedan architecture, especially so on designs of ornamentation.

This architecture was without question a *living* one, was *indigenous* with the people who gave it existence, though not with the countries where it came to life.

ROMANESQUE ARCHITECTURE.

The Christian Basilica, already alive with the nations, grew with the progress of time. It became elaborated. It also received choir, cross-aisles and towers. Its ceiling was arched. Thus it was, as a matter of fact, transformed into the Romanesque cathedral or dome. The construction of this is carried to its practical limits, so far as this is possible without change to the constructive principle. The wall retains its ancient character. It is merely strengthened by means of buttresses, which in very many cases are kept even against the inner faces of the walls. Towers stand upon the strength of their walls and need no buttresses, nor are flying buttresses ever thought of. The art bears the true *life* of a Christian architecture, but it is not indigenous.

GOTHIC ARCHITECTURE.

It would not be correct to say that Gothic architecture was derived from Romanesque. It is merely an independent side issue to it. It does not modify the ground form established. It merely modifies its robe, and does it essentially so. It wholly abolishes the wall and puts in its stead the buttress, emphasizing it in a manner so that a flying buttress is established as serving both the principle of thrust and that of ornament. Windows become wider and in consequence higher. The pointed arch is therewith introduced and a new manner of tracers applied. The buttress is applied on towers, which also lose their walls proper and grow into heights never before conceived, the very spire being but one sort of areal continuation of the prin-

ciple on which the whole tower is based. The utmost consistency as to construction is now arrived at. All detailed parts show an ornamentation tending to a like end, are essentially of a like character, merely diminishing in size as they are to suit minor parts.

Repeatedly the question has arisen whether, on this account, Gothic architecture should be classed as high art proper. It is held to be more like a practical problem of statics in which the free scope of high art is but of diminutive proportions. The skilled and educated mechanic is the proper man for a creation of the handsomest and best Gothic cathedral. The awe which it attributes to the beholder, in view of gigantic proportions, does in no way differ from the awe conceived in attentively observing the Cheops pyramid, an Indian temple, or any similar gigantic object. In our case this awe is associated with a more or less profound feeling of faith, of historic patriotism, or any similar noble feeling. But in what measure does this lead to a recognition of high art? My own honest belief is that every really schooled architect ought to be competent to design a perfect Gothic cathedral with undoubted success. There is nothing needed therefor beyond a somewhat dry copying of established forms.

It would seem to be worthy of note that the appellation "Gothic" to this form of architecture[10] is of an origin peculiar in character. Goths had been for a number of years the rulers of Italy. Though about five hundred years had passed since their total extermination, there was still a national hatred against them alive in the country, and the new style of architecture then coming up was named Gothic, evidently so because the Italians held it in a sort of contempt, and gave expression to such feeling by calling it as they did. It would seem singular in fact that such a nickname, as it was, found general adoption. I trust the fault was with the Germans. When we consider the fact that the Italians, as a nation, at all times were possessed of a more or less spirited feeling for high art, which soon after this period began to and actually did grow to the highest significance, it ought to be excusable for any one nowadays to, in a measure, participate in this judgment.

Gothic architecture, fostered by the Church then becoming supreme in the world, and loved by the mass of people of Christendom, unquestionably was a *living* art. It was not indigenous.

RENAISSANCE.

The Renaissance is most emphatically an era of new life. The sphere of earthly territory had been doubled, the sphere of art and science lifted to a loftier basis, expanded more than ten-fold in volume. But this has not come about suddenly. On the contrary, it came as the ripened fruit from the tree of progress, which had put out blossoms even in the times of "Dark Ages," so called. But the discoveries so immense, the inventions so important and manifold, the universal avidity after information which had pro-

duced a mass of learning: all these factors in common contributed to give this age a character so enormous in all its proportions that it is proclaimed to have been the most eventful and important age in the course of all history. But it is very far from having been a revolution. It was fertile merely in destroying old prejudices. The heroes of the ancient heathen world would live peacefully in contact with the martyrs of Christendom. Peace seemed to have been established. The thousands of remnants of ancient Rome spread over her territory, these visible tokens of her everlasting glory were raised from their sepulchers and ideally brought to a new life. But the masters to this resurrection were not copyists. They knew how to impart a new life into what had been buried for so many centuries. For a time this life, it may be said, was in its home country a genuine one, so that the art *may* be called a *living* one for Italy. But it was not indigenous.

MODERN ARCHITECTURE.

The age of Renaissance had manifoldly multiplied the complications of national life. Since then these complications have ever increased with the march of progress throughout, and particularly so with that of mechanical arts and sciences. Without the aid of an overpowering genius high art could not follow. And yet could any living man give us a true conception of this genius? I am afraid this genius does not dwell even in the most imaginative mind of any one living at the present day, and hence we should discard every fanciful idea of this sort. We touch, I fear, absurdity.

The consequence of this state of affairs is that art, especially architecture, gets more or less involved in what may be called politics, and accordingly moves on in this or that sort of fashion, here or there, and is called as being of this or of that sort of style, be this Louis XIV. style, Jesuit style, Rococo style, pigtail style, and so on, till classic Renaissance shows up and thereupon at last the expressed desire of the present day to arrive at a positive style, and the consequent dilemma which has given rise to the questions heading this article.

FIRST QUESTION.

The very crude synopsis given in the above bears witness that the question, "*Is Architecture a Living Art?*" must be answered in a *negative sense*. At present it evidently is a dead art.

In the early part of history the people were everywhere held in absolute bondage by the government and a priesthood as its agent. Republican governments were no exception. Their people were no less subject to a gross superstition which at all times had been bound to uphold ancient legends of a mysterious character, whatsoever they might be. In all cases the building art is found to be most intimately connected with religious rites. So long as these had life with the mass of the people, so long lived

with them the particular style of architecture cultivated. In fact it is the outgrowth of this particular culture.

After the ancient world had gone to pieces, from want of faith and consequent want of binding morals,[11] Christendom had become the savior of mankind. New places of worship came in demand, and their construction was more and more aided by the constantly growing belief that sin, so difficult to be avoided, could be forgiven through monetary and corporal assistance in the erection of places of worship. A Christian architecture arises and is brought to a grand issue. More so than any architecture in the world, it has been, in all its phases, a living one.

As to real life with Renaissance architecture a slight doubt should be kept in mind. This doubt, however, wholly disappears with modern architecture in all its past and present phases. Especially at the present day there is nothing more certain than that architecture, as it is carried on, has no sort of recognized living relation to any of the nations in which it is practiced. It does not live in England, Germany, France, Italy, nor in any country of the world, particulary so in our own country. But we should keep in mind and duly consider the fact that the several nations, in spite of the general love of mankind inborn with man, of science and of commerce, the rulers of the world, tending to tie them together in one common family, are nevertheless in a manner kept apart by themselves. They have ever been subject to a sort of natural force which invariably tends to separate them. Every nation has its own especial character and is at all times bent on upholding and ever nursing it. This character, though subject to decline as well as to rise, seems nowadays decidedly to be on an onward course, so that in due time it may arrive at a condition which permits, if it does not demand, the state of a living architecture. But no hope, I expect, can be had for any such result prior to the advent of a far more exalted commonwealth.

As to a question of what ought to be understood under the expression "living architecture," it is due to say that it is nothing more than this: It should attract and conquer the hearts and the bone and sinew of the people constituting a commonwealth. Nothing further seems to be required. Any explanation beyond this would tend to cloud rather than enlighten. Definitions of an old school are often wanting because overcharged.

CAN ARCHITECTURE EVER BECOME A LIVING ART?

The question has already in a manner been touched in the foregoing. Architecture *can* become a *living* art with a nation if the nation's evolutionary course moves and grows in corresponding channels. To such an end there is needed an indolent willingness, even a readiness, on the part of the people, and an active, a very active, energy on the part of the architect. The architect must thoroughly understand the people and know, even feel,

their wants. He must be able to thoroughly master his business and to succeed with all work to greatest satisfaction. He is to be a scholar in every line of knowledge pertaining in any way to his occupation. He is no less to be a modest teacher to the people, who but through his agency can lastly become aware that they as a nation are enjoying the glory of a living architecture. And from the difficulty involved in the case it should at once be judged that the architect here in question represents a number of generations of architects all truly bent on this issue.

PRESENT ARCHITECTS' REQUIREMENTS.

The progress of society is governed by the masses of a nation led by conspicuous individuals who understand how to concentrate and bring to life what has for a long time been slumbering. This onward course is, we feel assured, in spite of despondency here and there, the case with our nation. And in this onward course the architect must strive to gain a firm foothold. He must strive to elevate himself in dignity before the public, must study to this effect the masters of the Renaissance and all others who enjoyed the esteem of their nation. But in order to be able to do this he should first become penitent and pray: "O Lord, have mercy on me, poor sinner," and be aware that the prayer of the Pharisee is not becoming. Even the best among us will, or ought to know, that he is wanting, and should have a willingness to admit this on the principle represented by no less a man than Socrates.

The following rules may be given as requirements for an architect of the present day:

1. He must do his work independently and with good conscience.
2. He must not run after work, nor sneak it away from his fellowmen.[12]
3. He must not enter into any sort of competition,[13] privately or publicly, unless such competition is had under a specified code issued by some publicly acknowledged authority of the profession. Otherwise the competition is "cut and dried," a delusion and a snare, while rightly managed it would be a thoroughly educational factor.
4. His heart must be filled with the dignity of his profession which he must be ready to uphold at any and all times.
5. He must ever be acquainted with a general knowledge of art and science current in all society, so as to be somewhat of a master if not of all at least of a special number of branches of his calling, enough so as to enable him to serve in advancing the same.

A strict application of the tenets of this rule may for the present now and then be more or less perplexing, yet it should in reality be considered being an educational factor for the public. A client generally is in the habit of dictating his wants in a manner which indicates that he has already somehow prepared his plan. He gives not the cause but the result, such as his

insufficient knowledge of planning has brought out. Here it is the architect's duty to take human nature to account, duly inform himself of the case and instruct his client, who generally will be pleased with the experience that for once he has found an exception from the old rule, which had ever taught him that the architect could not be supposed to know anything of his own—the client's—business.

EDUCATIONAL REQUIREMENTS.

Important improvements are required not only in professional schools, but in all from the beginning upwards. I side with those who reject the system at present generally prevailing in our schools. The memory is crowded, the mind more or less neglected, a kind of emphasis being in a manner attributed to memory at the expense of mind. This state of things should be amended. The mind is ruler and memory but its minister. Is it impossible to give public recognition to this common-sense principle? True, teaching under it is more expensive than is the usual mode of teaching. The teacher himself must be one of a higher class, better educated than generally he now seems to be, and be better rewarded, before it could be demanded of him to teach more intellectually, which means without text books. Time is required for an evolutionary process of the kind. But public attention should ever be active in the right channel. A beginning must be made.

It may deserve mention here that our system of teaching spelling should be abolished. It solely appeals to memory and leaves the mind where it was. This is so irksome and objectionable to the more gifted among pupils that it nourishes a tendency toward destroying their good will toward progress.

The student architect consistently and thoroughly educated in a general college, also skilled in the rudiments of drawing, proceeds to a special college for instruction in his profession. He should find there many improvements on the kind and nature of instructions at present in vogue. He should find a professor of higher order. This professor should be a philosopher in the truest sense of the word, broadcast in his training, and who has carefully and conscientiously elaborated for himself either his own or an adopted system of teaching. He especially prepares himself for each and every lecture to be delivered, and gives it *without the aid of a text book*, regarding this as a dull and unworthy auxiliary. He is bent on representing important objects in his lecture in a more lively manner by giving them a sort of reality in space,[14] in projecting them on an enlarged scale, and so as to be plainly perceptible to the eye of the student, on a large board behind him. He in a like manner also shows maps which are of interest on the subject. This will afford him the best chance for a more minute and clear explanation, than assuredly it is possible to give in any other manner. The

student's interest is attracted. His lively attention is stimulated and he will carefully make all proper notes on the sheets of his daybook, and accompany them with hand drawings more or less neatly made. What is here said refers in particular to lectures on history of architecture. It would lead too far to dwell on other subjects, especially that of drawing, in which it should not be forgotten that the hand must serve as a tool to the mind. Lessons given in a dry mode of mere copying drawings are of very little use, if of any at all.

THE COMING ARCHITECT.

The young architect thus prepared and fitted for his business is at last in a practical position to further widen the scope of his knowledge and experience in the pursuit of his calling. If he is talented, so that with a fair memory he combines also a fair surety and rapidity of intellectual action; if his hand is schooled enough to give proper picturesque and other expression to the dictates of his mind; and if this (his mind) is possessed, in a manner, of a truly inventive faculty, then he is in a position to advance more or less, the character of his calling. And if the quality of mind is of a higher order, so that he could conceive and bring to life ideas far—very far—remote from those of an ordinary mind, and do this with astounding certainty and rapidity, then he is what the world understands to be and calls a genius. But the number of positive genii in past history has not been so profuse that we should in any manner base our hopes—I repeat it—on the advent of a genius especially sent by Providence as a redeemer of architecture. A good share of progress in this wide world, especially in this modern age, has been accomplished through the working agency of a large number of men who understood how to attract, teach and move the multitude. And are there not, even already to-day, gifted men among us in our calling? And will or could there ever be a time bare of gifted men anywhere in any sphere of modern society, especially in our country? On these we must base our hopes and concentrate in a manner around them. We must hope and expect that this will be done, most especially by the coming architect; hope that his higher education will tend to make him both humble and proud, as occasion may demand: humble that he may submit earnestly and with honest devotion to superior talent, and proud that he may keep aloof from all kinds of error which constantly beset him. The coming architect of a better future, with his superior broad education, with his improved mode of moving in society, in which he finds himself acknowledged, with his widened and more ripened talent, the mother of his intellectual outfit; he himself and nobody beside him, must be expected to be the coming redeemer to the profession. He will not rely on another Moses to come and help him out of his captivity. On the contrary, he will rely on the old and true adage, "Help yourself and God will help you," and through and with this

he will have the moral power and the sober will to practically advance his calling into a higher sphere. And in doing this it may truly be said, he has put his foot in the ideal path that *leads to the gates of a living architecture.*

If the above is a true picture of what should be done, if ever we are to be gratified with possessing a living architecture in our country, as I trust we shall at some future time, the present profession should not hesitate with beginning to start on the march indicated. Will they do it, or ever attempt to do it with any degree ofearnestness? Let it be so hoped. I trust the time will arrive—if it is not already here, at least within sight.

ABANDON STYLE NOTIONS.

Impliedly it would follow from the above that architecture must not be any further hampered, as it has been, and mostly as at the present day, with style notions. With them as rulers we can never land on a shore of living architecture. True, the works of bygone ages are of the highest interest to the living generation. They reveal a profound cultural history of the various nations, and are monuments of their ancient power now extinct for so many centuries. But have they retained any living relation to our present age? Past ages never repeat themselves. Our age in particular is essentially distinct from ages past, even so from the latest age, remote but one century from the present day. The styles are bygone, not so the elementary parts fundamental to a building art. All progressive nations, at all times and in all ages, have employed them. They are also left as a sacred inheritance to the present age. They permit and allow variations infinite in number, not, however, to be used promiscuously but in a manner conformable to the use of tones in a composition of music.

"Style," says Semper, "is the coincidence of a work [of architecture] with the history of its birth, as well as with the conditions and circumstances which are thereto causal." With every task before him, the architect is informed as to the causal motive which underlies it, and with the circumstances accompanying. It would seem evident that the term "style" above used is there used as simply referring to one task; no relation is had in any way to a manner of work here and there prevailing in ages past. Nor is it more than questionable whether any of the ancient nations, so remote from this age, ever thought of emphasizing their especial mode and manner of building by naming it with what we call "style." Was not this, moreover, done by modern people for the sake of a mere convenience?

If so we must feel the more assured that the above Semper definition is in the main correct. And from this it would follow that every architect, inasmuch as he has standing merit, must be said to have *his own style.*[16] This

has ever been so, as is well known, with a painter and a sculptor. Why then not with an architect?

Cultural history, from the earliest predominance of man onward has developed the various singular forms which have been during all ages, are yet, and will ever be, the tones to this composite music of architecture. Harmony and beauty come in view. They come to us as friends and counselors, with a benign warning that we may not stray at random into unholy fields. We are ever to keep in mind that they shun active affiliation on their part. Their friendship, their embrace, must by us be conquered in a battle of sober and earnest endeavor. *Frederick Baumann.*

---

1. The questions were brought up in a meeting of the Illinois Chapter of American Architects, accompanied by an article read by Mr. P. B. Wight, associate member. The questions were left open.

2. Gottfried Semper died about eight years ago. Is the first architect in this modern age to whose memory a full statue was erected, at Dresden, Germany.

3. Exodus XXV to XXVII.

4. Present population four to five millions.

5. As this would indicate, the country had a very long cultural development prior to history. Former rulers would seem to have lent their names to subsequent deities.

6. Heinrich Brugsch: Religion and Mythologie der alten Aegypter.

7. A list of these commandments, or denials, may be found in Masparo's 'Dawn of Civilization,' pp. 188-191. Prof. J. H Breasted, of the University of Chicago, is author of a translation of the large Papyrus of "Isty" at the Field Museum, which is reported as giving a somewhat different version.

8. Detailed accounts of interest are given by Adolph Botticher: Die Acropolis von Athen: Berlin, 1888.

9. See Hans Schliemann; Betrachtungen ueber Bankunst; Berlin, 1891.

10. All so-called Gothic buildings exhibit, more or less so, a positive disinclination on the part of the Italians toward this type of architecture. The celebrated Campanile at Florence in particular bears witness thereto. Is it not rather of Giotto's own style than of Gothic?

11. Another cause is the ever-increasing consolidation of wealth with the few It enslaves the masses and despoils their integrity. Both causes operate on another. Does not this social fiend begin to show its claws already in our country?

12. Since with us the field of architecture is not in any manner legally confined, every architect, shoemaker, or tailor, that he might be, is on hand to lower the profession as indicated. Even well-to-do architects are not ashamed of such ruinous practices.

13. It is for the Institute of Architects to prepare a proper code of competitions. This ought to make it a point of honor with every architect to desist at once from a loose practice which ever must tend to debase his calling in the estimation of the public.

14. By means of an instrument called *skiopticon*. See article of Herman Grimm in *Deutsche Rundschau*, June, 1893.

15. A conforming idea is expressed by Hans Schliemann, above mentioned.

16. The late Richard M. Hunt, of New York, so well known to American citizens, has been prolific with manifestations of a style of his own, in many instances much to be admired. So may our Rookery and a number of other buildings of our city be said to exemplify a style of the late John W. Root.

QUARRIES IN BELGIUM.

THE number of quarries, laborers, and value of production from 1883 to 1893 is given in the following table:

Year.	Number of quarries.	Number of laborers.	Value of production.	Year.	Number of quarries.	Number of laborers.	Value of production.
1883	1,556	27,333	$8,316,017	1889	1,812	30,292	$7,061,641
1884	1,589	26,496	5,129,227	1890	1,701	31,681	7,581,040
1885	1,605	24,246	6,319,978	1891	1,666	25,717	7,298,874
1886	1,675	23,312	6,235,251	1892	1,631	29,012	7,419,306
1887	1,617	25,088	6,410,109	1893	1,559	29,191	7,896,569
1888	1,780	29,451	6,442,147				

*GEOLOGY FOR QUARRYMEN—III.

DEVELOPMENT OF CLEAVAGE AND FISSILITY IN HETEROGENEOUS ROCKS.

WHEN a set of layers, either sedimentary or not, of different lithological character are folded, and cleavage or fissility develops in them, the process is not simple.

As the case of alternating sediments is the most important one, and somewhat different from any other, this will be first considered.

The original series, instead of being homogeneous, is composed of beds of different characters; that is, it consists of alternations of mud, grit, sandstone, limestone, etc. Before these rocks are folded the forces of consolidation, cementation, and metosomatism may have been at work. As a result of these prior alternations, combined with original deposition, the strata may have greatly varying strength. The sandstones may have been transformed to quartzites; the grits may have been changed to graywackes; the muds may have been compacted into shales; and the limestones may have become crystalline.

When such a series is folded the accommodations occur mainly along the beds (Figs. 118 and 119). The greatest readjustments and greatest compression are along the limbs of the folds (see Fig 103). Each layer shears over the one next below under enormous stress. The necessary movement at first is largely concentrated in the weak layers between the beds of stronger material (Fig. 133 in February STONE). The shearing extends from these into the harder ones, for when motion has once begun along a certain set of planes, that very movement weakens the rocks along these planes and makes it easy for the forces applied in any direction to be decomposed into forces producing further movement along the same planes.

The maximum force producing shear is composed of horizontal thrust and gravity, and its direction will therefore usually be inclined to any layer in a horizontal position, although if gravity is unimportant as compared with thrust this inclination may be slight. When the layers become tilted this inclination is marked, although the problem becomes more complicated on account of the strength of the individual beds. These tend to decompose the forces which they receive at one point into components parallel and normal to themselves, and transmit the longitudinal thrust to another point. Upon the limbs of the folds the beds are, however, never free from superincumbent weight, and the rigidity of the overlying beds must also be often

overcome. Therefore, in nearly all cases of heterogeneous rocks the direction of greatest normal stress is inclined to each layer. There are two classes of cases—those in which the rock bed is in the zone of flowage, and those in which the rock bed is in the zone of fracture. The first afford conditions for the development of cleavage; the second, those for the development of fissility. Between the two there may be gradations.

DEVELOPMENT OF CLEAVAGE IN HETEROGENEOUS ROCKS.

For a given very small area in a stratum the cleavage may vary from parallel to perpendicular to the bedding. If at anymoment the direction of the greatest normal pressure is in the direction of bedding, the secondary structure will tend to develop at right angles to the bedding. If, on the other hand, the direction of greatest pressure is at right angles to bedding, the cleavage will tend to develop nearly parallel to the bedding. Between these two there will be all gradations. For different beds and different areas in the same bed the direction of greatest pressure will, at successive times, vary both relatively and absolutely, and therefore the cleavage developing in the normal planes at any given moment will gradually vary in direction. For a small, practically homogeneous area the final resultant will be the same as in homogeneous rocks—that is, the cleavage will be perpendicular to the direction of greatest final shortening.

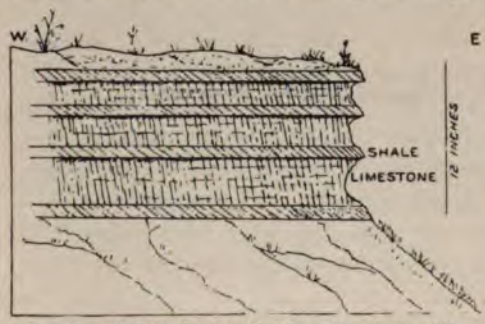


FIG. 87.—Sketch of ledge of alternating beds of limestone and shale, showing the different effect of these materials upon cleavage (differential cleavage). Erosion has in turn also affected these materials differently. Jackson, Washington county, N. Y.

Having made this general statement, let us inquire more particularly how the forces producing cleavage act in heterogeneous rocks.

As a result of the folding, combined with denudation, the relative amounts of thrust and gravity vary at different times, so that the average direction of greatest normal pressure for a given area also varies. On account of the differing strength of the beds the forces received by them are decomposed to a greater or lesser degree into directions parallel and normal to themselves, and thus the direction of greatest pressure is varied at each particular point. During the folding process the inclination of the beds is constantly changing, and as a consequence any given small area is being rotated with reference to the greatest pressure. The problem is further complicated by the readjustment between the beds, which constantly changes the relative position of the material with reference to the pressure. Lastly, the readjustment usually takes place mainly within the weaker layers, and

this changes by a varying amount the relative positions of different parts of the beds with reference to the greatest pressure. At any given point there will be a plane in which are the major and mean axes of the mineral particles, and this will be the plane of cleavage. It is evident that this plane

FIG. 103.—IDEAL PARALLEL FOLDS.

will vary in position from place to place. These conclusions follow from Professor Hoskins' discussion on strain and stress for all of the different compressions, acting in different directions at different times, are equivalent to

FIG. 111.—IDEAL COMPOSED FAN FOLD.

some single compression acting continuously in one direction, and the shearing motion of a differential movement is equivalent to a compression combined with a rotation.

Very frequently the position of the cleavage with reference to the bedding for a given small area will be controlled by the readjustment between the beds. The structure will tend at any moment to develop in the normal planes, but as a consequence of the shearing the material is rotated so that the final direction of cleavage is inclined to the direction of greatest pressure. Since the readjustment is mainly concentrated within the weaker lay-

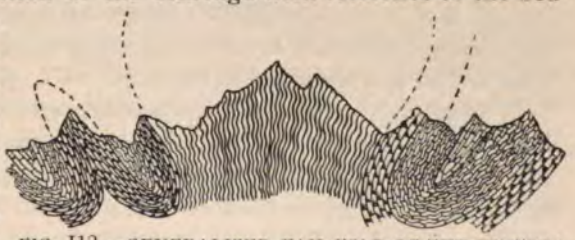


FIG. 112.—GENERALIZED FAN FOLD OF THE CENTRAL MASSIF OF THE ALPS. AFTER HEIM.

ers, the structure may be so rotated in them as to approach parellelism with the beds, while in the adjacent beds, in which there is less differential movement, the structure may be nearly at right angles to the beds; and at various positions between the cleavage will have intermediate directions. There will thus be developed a cross cleavage in the more resistant beds; and at various positions between the cleavage will have intermediate directions. There will thus be developed a cross cleavage in the more resistant beds, which varies by a gentle curve into parallel cleavage in the weaker beds.

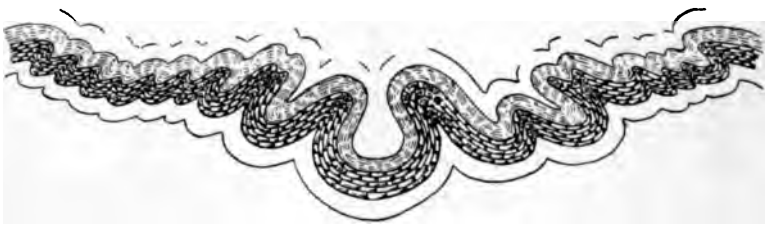


FIG. 114.—IDEAL SECTION OF AN INVERTED INTERMONT TROUGH.

On opposite sides of the layer the curves are in opposite directions (Fig. 131). By these curves it is easy to determine the relative directions of the movements of the layers.

Directly following from the above we have the explanation of the step cleavage of the older authors and of Becker, and of the differential cleavage of Dale. In this case the change in the direction of cleavage, instead of being gradual, as it is in rocks of gradually varying plasticity, is somewhat sudden in passing from one bed to another differing in rigidity. As a result

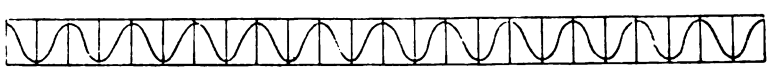


FIG. 118.—REPRESENTATION OF SIMPLE SYMMETRICAL FOLDS.

of the shearing motion the cleavage is rotated more in the more plastic layers and less in the less plastic layers. Hence, in heterogeneous rocks having cleavage, in a soft layer the cleavage more nearly accords with bedding than it does in a hard layer (Fig. 87).

To summarize: We have the absolute direction of greatest pressure varying; as a consequence of the difference in the strength of the beds we have the direction of greatest pressure varying from place to place; we have the material of any given area on the limbs of folds rotated with reference to the direction of greatest pressure; and, finally, we have variable differential motion between the beds, which would momentarily change the direction of the area with reference to the pressure. However, as shown by Professor Hoskins, these all combine to produce at any given point a shortening of

the particles in one direction and an elongation in one or both directions at right angles to this. Newly developed mineral particles have similar orientations. At any point perpendicular to the final position of the shortest axes of the mineral particles there will be the property of cleavage. As the differential movement at any given place is parallel to the dip, the longest axes of the mineral particles will be in the plane of cleavage and in the direction of dip. The mean axes of the mineral particles will be in the same plane, but in the direction of the strike of the cleavage.

If before the folding a cleavage had already developed parallel to the bedding by deep-seated metasomatic change or by flattening parallel to the bedding below the level of no lateral stress, this would modify the direction of the secondary structure, making it more nearly parallel to the bedding than it would otherwise be.

In areas of symmetrical or gently inclined folds and in homogeneous rocks the shortening is approximately in the line of the horizon and the cleavage therefore steeply inclined. In heterogeneous rocks the differential movement between the layers is ordinarily upward for a higher stratum as compared with the one next below it. In the case of abnormal folds this differential movement is emphasized. Consequent upon the differential movement upon the limbs of the fold in weak beds where the shearing motion is largely concentrated, the cleavage is locally flatter than in homogeneous rocks. Whether the rocks are homogeneous or heterogeneous the rotation will be in opposite directions on opposite sides of anticlinal arches or synclinal troughs, being outward for an anticline and inward for a syncline; therefore on opposite limbs of a fold the cleavage usually dips in opposite directions. Upon opposite sides of an anticline the cleavage usually diverges downward, and on opposite sides of a syncline it usually converges downward.

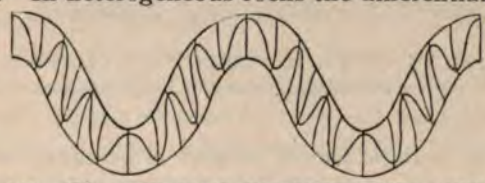


FIG. 119.—THE SAME DISTORTED INTO ANTICLINES AND SYNCLINES.

Ordinarily the rotation of shearing will not go far enough to bring the cleavage into correspondence with bedding, and therefore its dip will be steeper than the dip of the strata; hence, on opposise sides of a fold the variation in the dip of cleavage is less than the variation in the dip of bedding. However, in the case of much-compressed normal composite folds (Figs. 111 and 114) the force of gravity and unequal thrust control the direction of the moving force, and consequently the form of the secondary folds. In this case the cleavage may be rotated from its ordinary position, and upon opposite sides of the anticlinorium the cleavage may converge downward and upon opposite sides of the synclinorium may diverge downward. This ap-

plies as well to the central fan folds as to the minor folds on the flanks (Fig. 112).

It has been pointed out in the case of much-inclined or overturned folds, that the resultant differential movement or shearing between the strata on the steeply inclined or overturned limb may be down for a geologically superior stratum as compared with an inferior stratum. It follows that the shearing on both limbs of the fold is in the same direction; and therefore that in regions of overturned monoclinal folds the cleavage may be rotated in the same direction throughout, and will hence be monoclinal (Fig. 134). Since on monoclinal folds the differential movement is great on the longer and flatter limb of the fold, the cleavage may be rotated so as to be almost parallel to bedding, but usually is somewhat steeper. As the resultant differential movement is comparatively slight on the steeper, shorter limb, the cleavage usually cuts across the bedding at a considerable angle and is steeper in reference to the horizon. On the opposite limbs of monoclinal fan-shaped anticlines the cleavage may be nearly paral-

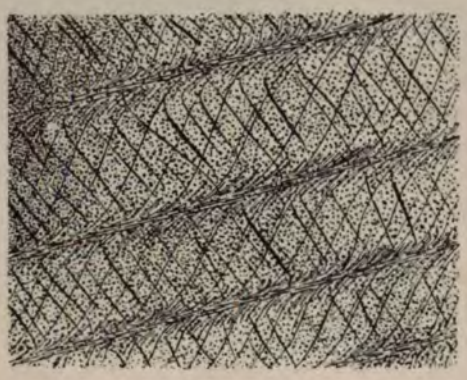


FIG. 131.—PARALLEL FISSILITY AND CROSS FISSILITY IN HETEROGENEOUS ROCK STRATA.

FIG. 134.—RELATIONS OF CLEAVAGE TO BEDDING IN MONOCLINAL FOLDS.

lel, or may even converge downward, and on the opposite limbs of monoclinal fan-shaped synclines the cleavage may be nearly parallel, or even diverge downward.

This contrast with symmetrical folds is due to the continuous rotation in the same direction of the cleavage along the arch limb of the fold combined with the rotation in the reversed limb, first opposite to and afterward in the same direction as that on the arch limb. As in the case of symmetrical

folds, the variation in dip of cleavage is less than the variation in the dip of bedding. In districts in which cleavage and bedding have the relations above described, on the longer arch limbs it is often difficult to discriminate between the two, but it is believed that the cleavage is usually slightly steeper than the bedding, as already explained. On the steep or reversed limbs the minor crenulations of the strata are usually easily detected intersecting the cleavage.

When rocks are openly folded the discrepancy between cleavage and bedding is usually great. As the folding becomes closer the average discrepancy becomes less. If the compression goes so far as to form isoclinal folds the bedding and cleavage may nearly correspond upon the limbs of the folds, but the two will be at right angles to each other upon the crests of the anticlines and in the troughs of synclines (Fig. 133). When the compression is so great as to form plicated folds, the changes in the direction of bedding being very sharp, the discrepancy between bedding and cleavage will be slight. However, the discrepancy is real and important. The cleavage in this case may be parallel to the axial planes of the folds, and will cut the beds at a very acute angle. In many districts where cleavage has been described as everywhere according with bedding, and the two do approximate but not exactly accord in direction upon the limbs of the folds, a close examination shows that on the crests of the anticlines and in the troughs of the synclines the two structures intersect each other.

At the beginning of the process it may be noted that the shortening is at right angles to the bedding. Thus the work first done is partly undone. The resultant position of the shorter axes of the mineral particles in reference to the bed is intermediate between the two extremes.

Charles Richard Van Hise.

[TO BE CONTINUED.]

THE FORMATION OF NATURAL BRIDGES.

PROMINENT among the rock formations which have attracted the attention of student and sight-seer alike, are the arches of solid stone spanning deep chasms, and forming an unbroken union between massive cliffs on either side. Were they more common they would be, perhaps, less noted; but so far, very few of them have been brought to public notice, and it is probable they are of rare occurrence. The opinion has been advanced by some geologists that natural bridges are the remains of former caverns. It frequently happens that the roof of an underground chamber approaches so near to the surface of the earth as to be unable to support the weight of rock and soil above it; consequently it gives way, forming a sink-hole. If this process continues a sufficient length of time, the entire roof will fall in and the cavern become an open ravine. Sometimes, however, one portion of the roof may be so thick or so strong as to hold its position after all that part

to either side of it has disappeared, and this fragment which remains constitutes what is know by the name of a "natural bridge." While this theory is simple and may be correct, in regard to some of these formations it is clearly erroneous when applied to others. Caverns are usually very tortuous, seldom preserving the same direction or level for any considerable distance, and there are very few whose shape is such that they could under any circumstanees be converted into open ravines. Still, such do exist; and the above theory is satisfactory concerning bridges found under such conditions. But there are at least three other varieties of these formations for which it cannot account, and for each of these a separate explanation is necessary.

As a type of the first class may be taken the most famous and perhaps the largest natural bridge in the world; namely, that in the Shenandoah valley of Virginia which gives its name—Rockbridge—to the county in which it is found. In this instance, the strata terminate at the river hills on one side, and rise to the surface of the ground beyond the bridge on the other. Water sinking into the earth sought an outlet toward the James River by following the lines of separation between the strata and dissolving the limestone through which it flowed, produced a tunnel or underground passage open at both ends. The upper strata were much less affected by this erosion than the lower, for a smaller amount of water made its way into them, besides which they were, from their position, compressed and hardened and thus better enabled to resist the destructive process. When this passage became well defined the wear was almost entirely at the bottom and ends, the central portion suffering no further change except that resulting from atmospheric agencies. No cave has ever been discovered whose ramifications bear the slightest resemblance to those produced by surface drainage, not one in which the various branches from a central chamber lead, without exception, to the surface of the ground at different points. In Hardy county West Virginia, a considerable stream, known as Lost River, completely disappears within a few rods, the water sinking between the strata of a syncline and re-appearing on the other side of the mountain in a number of great springs whose united waters form the Cacapon River. The rock is a hard, compact shale or slate; if it were limestone or other mineral soluble in water, there would be at this point a tunnel two miles long. Probably in this manner was formed the tunnel in Scott county Virginia, through which a public road once ran, and which is now utilized by a railway company.

The tunnel and natural bridges of Carter county Kentucky, which may serve as a type of the second class, had their beginning and development in a somewhat different manner, by reason of the difference in the geological conditions. Here the surface rock is a very hard carboniferous limestone, passing by a continually increasing admixture of quartz sand into a

typical sandstone below. As soon as a depth is reached at which the sand becomes appreciable in amount, false or cross bedding is very marked. Water passing through the upper layers dissolved more or less of the lime which acts as a cement for this sandy material, and when an outlet was once made below, the disintegration proceeded rapidly, until the nearly pure sand rock at the bottom was reached. In this way have been created two bridges, each surpassing in some respects that of Virginia, and a tunnel several hundred yards in length. Riffles and shallows, alternating with deep pools, are common in the streams of this region; but there are no underlying strata, at least none at present within reach, through which other streams may burrow. Four large caves in the vicinity have been thoroughly explored, and there is no point in any one of them where it would be possible for a bridge to form having any resemblance to those existing. The only similarity in the formation of the two phenomena is that both are results of underground drainage; and in none of them could the causes that have produced the one class have given rise to the other.

The third class which remains to be explained may be found in the massive, bedded limestone of the Devonian and Sub-Carboniferous deposits, better known in various localities as the "mountain," "cliff" or "cavern" limestone. Such stone being formed under the ocean, must contain a large amount of water, when it is elevated above the sea-level, this water drains away, and the stone must shrink, just as green wood does when it is seasoned. In this way are formed seams, or "joints" as they are called, which extend for a considerable distance downward, sometimes almost vertical. Surface water finding its way into these gradually enlarges them, forming sink-holes or "natural wells." Under ordinary circumstances, this water will continue to make its way downward, forming a cave, or it will re-appear in different places in the shape of springs. If however, there should be a stream or a deep ravine in the immediate vicinity, the water may reach this by following the lines of separation in or between the strata; and by constantly enlarging the passage thus made, it may form in time a ravine whose sides are united by the higher beds of the rocks through which it has bored its way. The famous "arched rock" at Mackinac Island may be taken as a type of bridges formed in this manner. Near the Kentucky caves above mentioned, is a natural bridge formed somewhat in the manner as those last described; but the rock in which it occurs is a sandstone instead of a limestone. Several yards back from the brink of a precipice is a vertical crevice in ground which is dry except immediately after a rainfall. Storm water, flowing into this and reaching the surface again near the foot of the bluff, has eroded the stone until it now presents an arch resembling that of Mackinac, but much larger in all its dimensions.—*Gerard Fowke, in Popular Science News.*

THE UNDEVELOPED ECONOMIC RESOURCES OF COLORADO.*

THE task before me is to state what those undeveloped or but partially developed resources are; where or in what part of the state they are to be found, and what their position is geologically, or rather in which of the successive geological formations composing plains, foothills and mountains they occur. We wish to so make clear the geological sequence and structure that a prospector or prospective investor may know as with a guide-book in his hand, pretty nearly where to locate the particular resource he is after.

The simplest method appears to me to be to give a general geological section of the formations of Colorado as they appear in rotation and then to locate what such contains. We have as a center of a grand uplift the granite nucleus and granite rocks forming the axis of the ranges, then receding back from this, as from an ancient shore line, are wave upon wave of uplifted strata popularly known as hogsback or foothill ridges, each ridge constituting part of one of those geological divisions of the earth's history, known as ages, eras, epochs, etc. They represent the primitive sea beaches and sea bottoms, and beds of fresh water lakes and swamps that were laid down through these consecutive ages along the shores of the granite islands or granite nucleus that now form the mountain ranges of Colorado. This will be clear by studying the generalized section as given in the engraving. Here you see to the left the granite nucleus forming the core of the mountains proper and the axis of uplift. This is called the Archean or beginning age. Then upon this follow in succeeding order like volumes in a library, Cambrian, Silurian, Carboniferous, Triassic, Jurassic, Cretaceous, Tertiary, Quarternary, each indicated by a particular set of uplifted strata having their peculiar features, colors and distinctive characteristics. What now do each of these contain that is at present undeveloped or capable of much greater development?

Prairie Region.—We will begin with the top dressing of the prairie. We will suppose a prospector toiling along on his pony bent for the distant ranges. As a rule the soil on the top of the prairies is of more importance as a resource for grass and crops, cattle and agriculture than anything below the surface or within reach of the deepest average borings or exposed in wells or in shallow cuts made by rivers. Certainly no gold, except per-

* Prom Denver *News*. Revised by author for STONE.

haps some placer surface gold, silver, iron or copper are to be expected and the prairie is a poor prospecting ground for the precious metals. The top stratum immediately below the turf is generally a layer of small pebbles and clay. This clay, a stiff drab clay of the loess division of the Quarternary period, is sometimes quite thick and makes good material for ordinary red brick, as at the brick-yards established in West Denver, which draw their material from banks of this loess clay, ten to twelve feet thick. Such clays perhaps represents the bed of a primeval fresh water lake. But before the prospector reaches Denver he may be attracted some fifty miles east at Akron, by certain low isolated table lands standing prominently up above

NORTH SIDE OF YULE CANON FROM MARBLE CLIFF

the general surface. These are relics of the Bad Land upper Tertiary formations stretching into the notorious Bad Lands of Dakota and Nebraska. These tables, a prominent one of which is the formerly well known landmark to prairie schooners called Fremont's Butte, where the explorer Fremont stood off the Indians, together with the strata beneath them exposed by the cutting down of dry arroyas, are formed of some remarkably fine and thick clays capped by layers of calccareous conglomerate and pebbly formations.

These clays, some of which are of remarkably fine texture, and of great thickness, together with a bed some ten to twenty feet in thickness of a fine clay closely resembling kaolin one of the few approaches to that valuable material for making white chinaware we have in the state, are well worth the investigation of the clay, pottery, brick and chinaware man.

There is no water in the region only what is obtained from wells, but the Platte is not many miles distant. The kaolin, if true kaolin it be, which is doubtful, is the only large deposit of the kind, except one five feet thick at New Castle, of importance in Colorado. Small veins and pockets of kaolin occur here and there, but not of mercantile importance. The one at New Castle, five feet thick, has been traced over a mile. This other is the most "undeveloped resource" of importance we meet on the plains, and belongs to the geological series known as the White river or Miocene Tertiary series. It is the relic of a vast fresh-water lake as testified by fossil remains found in its beds.

Ryolite Lava.—As the prospector nears Denver on the Divide between Denver and Colorado Springs, some thirty miles south of Denver, twenty miles east of the mountains proper, he encounters another series of isolated table lands, many of them forming rude castles and castle rocks. Several of these tables he finds to be capped with a layer of about fifty feet thick of beautiful pink, gray and dove-colored lava, called "rhyolite tuft." The rock is light in color and quite light in weight, cuts and breaks beautifully under the hammer for building stone, especially that kind of architecture which prefers a rough chipped rock frontage, a favorite in many buildings of a massive nature. This exceedingly popular building stone is exclusively quarried on the Divide region, but there are plenty of lava-capped tables left for undeveloped resources. The shades of delicate pink, lavender, dove-color and gray together with the ease of quarrying and of cutting and of chiseling the rock, make it a very desirable building stone, and one that gives a peculiar soft, refined look to a house. Underneath this rhyolite are heavy beds of very coarse pebbly sandstone. It is not improbable that these sandstones are the sources of the placer gold found at the head of Plum creek and in the waters and sands of Cherry creek. With water power duly used it may be there are some undeveloped resources in placer mining in that vicinity. It is worth mentioning that in the Austin bluffs, which belong to the same Tertiary or Monument creek Tertiary formation, Mr. Ehrich, of Colorado Springs, succeeded in getting from $2 to $10 gold. These extensive bluffs of coarse ferruginous conglomerate might reasonably be prospected, and if water power could be brought to bear, or some cheap method invented for crushing up the loosely consolidated conglomerates an undeveloped resource of free gold might be added to the revenues of the state. It is to be remembered that the "Banket" formations of South Africa so rich in gold are but conglomerates or pebble beds cemented together.

We do not meet this beautiful rhyolite building stone elsewhere in the state, but at several points north and south an earlier Tertiary series known as the Denver Tertiary or upper Eocene is capped with basalt as at the Table mountain at Golden, 12 miles west of Denver. This hard, almost black rock

MARBLE BEDS VIEWED FROM OPPOSITE NORTH SIDE

has never, that we know of, been utilized in Colorado, but its hardness would fit it well for a good paving or road metal, for which it is often used in the East. There is an unlimited quantity of it fallen from the columnar cliffs capping the Table mountain without having to climb their slopes for it. The black basalt is sometimes used as a variety with other building stones. With us in Colorado it is quite an "undeveloped resource."

Clays of Table Mountain.—The basalt rests upon a mountain composed of a series of chocolate clays and sandstones and conglomerates abounding in fossil leaves. Some of these chocolate colored clays appear to be of very fine texture, but have so far not been tested or utilized. They are composed of the comminuted feldspars from ancient andesitic lavas, blown by steam into dust and rearranged by waters into what are known as andesitic volcanic tuffs.

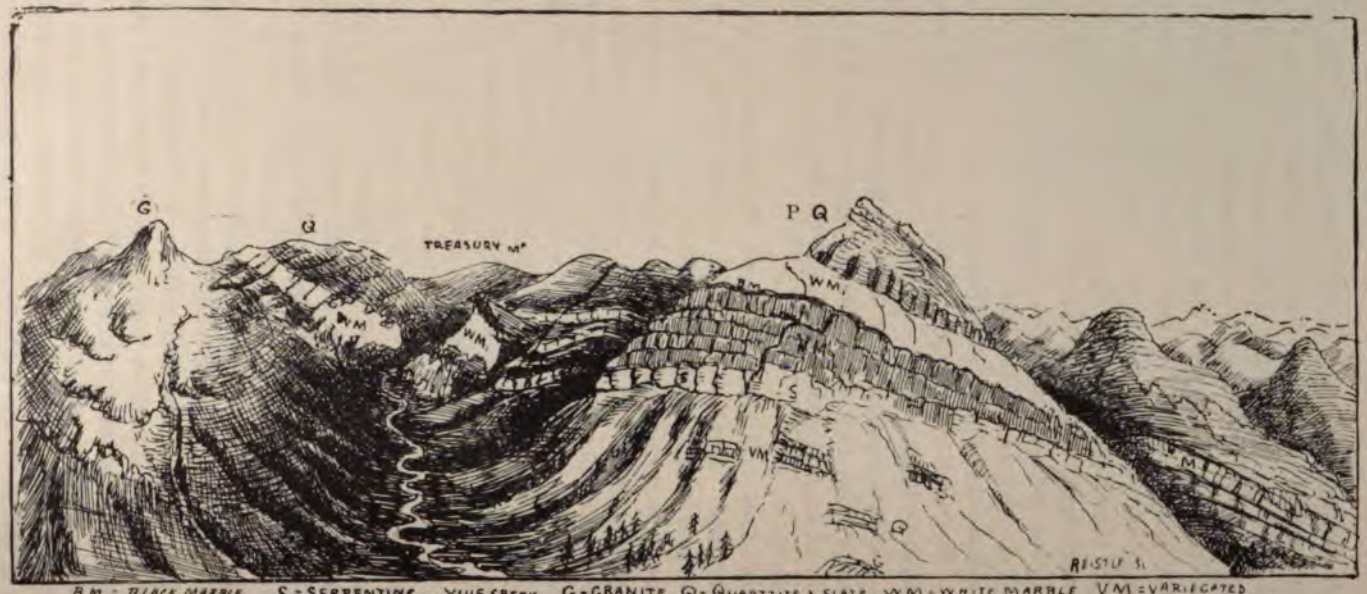
Clays and Coal.—So far all the strata the prospector has been passing are horizontal, now when within a mile or two more or less of the mountains, he encounters the first uplifted wave of the hogback zone flanking the range from end to end. It is a series of sandstone, and interbedded clays and most important of all one, two, three or more seams of so-called lignite coal of excellent ordinary and household qualities as a fuel. But before we touch on this vast and only partially developed resource of Colorado we must speak of the clay found geologically a little east of the upper part of the coal-bearing sandstones. There is a belt of these clays between often vertical sandstones that is from ten to twenty feet thick of a fine dove-color and exceedingly fine texture. It is between fire clay and plastic clay and is used for various forms of pottery, earthenware, sewer pipes and assaying works. It is quarried at Golden twelve miles west of Denver, quite extensively, but the same clays may often be found at various points north and south, along the foot-hills zone in close proximity to the coal a few feet or immediately above it. The group to which it belongs is either the lower portion of the Arappahoe Tertiary or the upper Laramie Cretaceous.

Building Sandstones and Grindstones.—Occasionally some of the white sandstones of this group form good building sandstones usually somewhat soft and easily worked and in large blocks. This is particularly the case in the southern part of the state in the Trinidad coal region, where the heavy basal white sandstone forming the base of the Laramie coal measures known as the fucoidal or seaweed sandstone, from fossil seaweeds in it, is quarried for excellent building stone. Some portions also make good grindstones. It is needless to say that there is any quantity of this thick, massive basal sandstone throughout Colorado. Its thickness is from thirty to one hundred feet. It often forms a conspicuous white line below the coal when seen at a distance in the coal table lands of the South. We shall allude to the coal later.

Plastic Clays.—The prospector after passing the uplifted coal beds and coal strata finds himself in a soft meadow-like valley of considerable width —it may be—a mile, more or less. This valley is underlaid by uplifted soft drab shales and shaly clays of the marine or Montana Cretaceous. This, throughout the foothills of Colorado, is a very thick formation from 1,000 to 6,000 feet in thickness, composed of the muds of an ancient sea bottom, as testified by the marine fossil shells found in it. This entire thick belt, with the exception of some sandy portions running the length of Colorado, north and south, may be considered as one vast deposit of plastic clays, adapted for and making excellent red pressed brick, a large manufactory of which is at Golden city, another small one at Boulder, and one or two other spots along the foothills. But wherever needed there are many square miles of these clays for use. The drab color of the shales and clays and numerous marine shells contained in them at certain points, together with their position as immediately geologically below the coal and between the coal hog-back on the east and the great Dakota sandstone on the west will generally locate their position and make them easily found by the clay man in search of good pressed brick material.

The Oil Bearing Zone.—But bricks are not the only products of this great zone of prairie clays. Down near Cañon City, along the banks of the Arkansas river, there is a vast development of these clays lying immediately under the relics of the coal strata above. At Florence artesian borings from 1,000 to 1,500 feet or more have been put down and multiplied, resulting in the discovery of a supply of petroleum oil at depths of 1,000 to 2,000 feet, the supply of which in some of the wells is upwards of 100 barrels per day and an extensive oil business has been established. There is no reason why these same Montana marine shales should not yield oil at other points in Colorado, where the same strata abounds, if properly prospected. At any rate, this is the geological zone of oil in Colorado, though signs of it have been found in the Dakota sandstone on Turkey creek in a lower horizon and in a still lower horizon in the Jurassic beds northwest of Cañon City. The same marine Cretaceous beds show a large oil field in the neighboring state of Wyoming. Montana Cretaceous marine strata there offer a large field of undeveloped resources in pressed brick clays and petroleum.

Limestone.—The prospector crossing the meadow of marine clays is confronted by an uplifted bank of grayish white limestone, that from its regularity looks like the banks of a railroad. Here he finds about fifty feet thickness of remarkably pure limestone consisting of ninety per cent. carbonate of lime excellent for building and lime qualities and still more excellent as a flux limestone for the smelter as well as for other purposes. It is quarried at different points along the foothills, particularly at Morrison, ten miles west of Denver, and at Cañon City, close to the penitentiary. This



MARBLE-BEDS HEAD OF YULE-CREEK

Viewed from below looking up the creek

belt of limestone, like most other strata, can be found more or less continuously along the foothills north and south, and is easily recognized by its containing large sea shells like big clams, as big as saucers.

The limestone belongs to the group of the Cretaceous, known as the Colorado group. It is also of marine origin, as testified by the big clam shells, called Inoceramus. A belt of upturned slate-colored shales full of oyster shells completes the Colorado group. These dark shales have not, so far, been utilized, and we do not know their quality. Some large kidney-shaped nodules of carbonate of iron clay stone occur in this strata, but the iron is not high enough in quality for use and the oysters are unfortunately petrified.

Building Sandstones and Fire Clays.—This brings the prospector to the great Dakota Cretaceous, hogback—a prominent hogback of hard sandstone that forms a constant and continuous lofty belt along the foothills. It is formed of heavy-bedded strata of sandstone, many of which make good durable building sandstone. In the center of this group, which is about 200 feet thick, is commonly a layer of dark gray blue clays, which may be from six to even twenty feet or more thick. These are the most important and remarkable clays in the state. They compose the celebrated Colorado fire clays, for which Colorado and the little city of Golden in particular is renowned throughout the union. It is probable there are no finer fire clays for refractory purposes for lining furnaces, making fire brick, or for all purposes where great heat must be withstood, to be found in the world. They are extensively quarried and shipped all over the states, but the deposit is by no means limited to Golden, for throughout the length of the state where the prominent Dakota hogback is to be found these clays may be found as a dark-gray layer of more or less thickness in the middle of the group between the sandstones. The Dakota group forms the base of the great marine Cretaceous beds, of which we have before spoken. In its origin it is unlike the others, being of fresh-water origin, and contains many curious fossil leaves imbedded in it. In the western part of the state near Telluride, the Dakota produces a narrow belt of workable coal.

Crossing over the Dakota ridge, the prospector descends its western slope over soft variegated beds of maroon, purplish green and gray clays and marls, whose utility has not yet been tested, but whose high colors suggest useful coloring matter for brieks and cements. Various cements might also, perhaps, be found on this slope. These beds belong to the upper Jurassic, and are noted for the fossil remains of gigantic lizards, called Dinosaurs, found in them.

Gypsum.—At the base of these variegated series of clays and between them and the adjacent hogback, which is of limestone, are at intervals along the range, considerable deposits of gypsum, some of it of an alabastrine tex-

ture. These are very prominent in the Garden of the Gods and near Colorado City and for a long distance along the foothills down to Cañon City and beyond.

Red Sandstone.—Also in this Jurassic series there occurs at intervals a remarkably fine grained red freestone sandstone, much used and valued, as a building stone, especially in ornamental work. There is a large quarry of it at Morrison, where it is of a pleasant deep pinkish-red tint. Farther down along the range between Colorado City and Manitou there is an extensive and very thick outcrop of this Jurassic sandstone, which is extensively quarried in Red Rock cañon, and blocks of almost any size are sawed out by machinery. The sandstone there is of a lighter and brighter red than at Morrison.

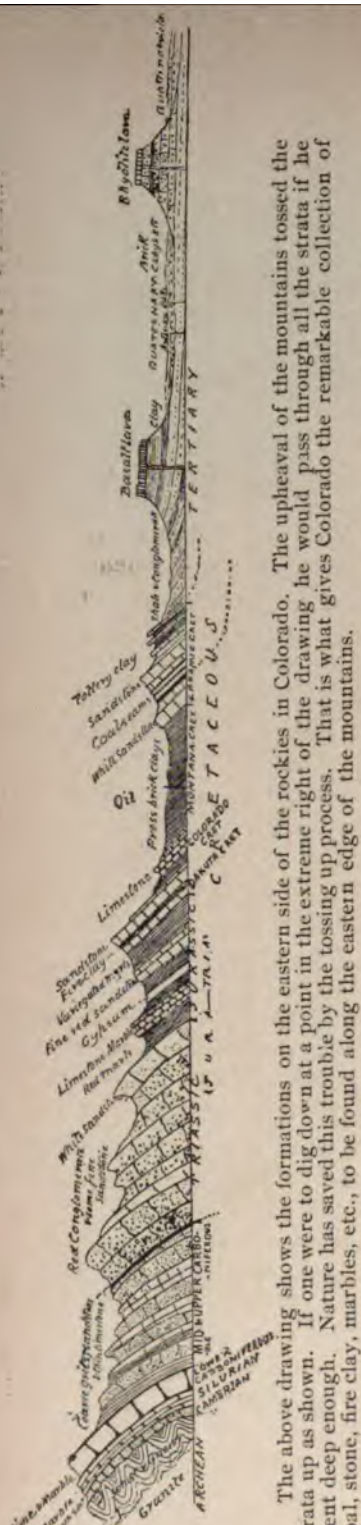
The prospector now finds himself well in among the hogback zone, and the next ridge he climbs is one of a greenish white silicious limestone much quarried for mortar and lime burning. This limestone or calcareous rock at certain localities north of Boulder and below Cañon City pass by metamorphic action into a beautiful mottled chocolate colored marble, quarried at Beulah and elsewhere.

Sandstone Quarries.—The prospector finds himself at this point among a labyrinth of rock ridges of many colors and grotesque forms, a deep red being the pervailing tint. The great mass of these rocks belong to the lower Jurassic division of the Jura Trias, are often unpromising owing to their being of a very coarse red conglomerate sandstone, too coarse generally for building purposes, but in certain limited localities as at Glencoe quarries, north of Golden, they pass into a fine grained red building stone, capable of blocks of any size. Still further north from Boulder, beyond Fort Collins at the Stout quarries, these Jura Trias red sandstones are extensively developed, and as over large areas they have but a gentle dip are available for quarrying. Besides Morrison red sandstone, an enormous industry has been developed from Four-Mile in paving slabs of this red sandstone, which will be got out in blocks of any size and thickness, with a width, without a flaw or crack, of ten to twenty or more feet and a perfectly smooth surface. Boulder city and Denver and some of our larger cities along the foothills have their sidewalks paved with these magnificent slabs, upon which we can often see the fossil imprints of the little saurians that walked, hopped or squatted upon the wet red sea sands of the muddy shores at low tide of the old Jurassic seaboard. Another characteristic mark is that of black tracings as of trees or moss called "dendrite," and caused by infiltrates of oxides of iron. The fossil footprints are visible in many of our Denver streets, particularly around the Denver high school and others on the sidewalk of Vine street near St. Barnabas' church. Quarries opened in these slabs remind one of piles of lumber stacked up in a lumber yard,

so regular and even are the strata. Immense shipments of these slabs have gone East, while smaller blocks have been shipped to Kansas City and other places for block street paving. At any one of these quarries you may obtain almost any kind of building stone you want, massive red blocks or paving slabs, or white sandstone, or gray, even to variegated chocolate marble. There is a vast "undeveloped resource" in these fine sandstone strata.

Lithographic Stone.—The Red Trias conglomerate brings our prospector to a halt, from the Wyoming boundary line south to near Colorado Springs. From this interval the sedimentary series of rocks cease against the granite, and the next step would bring him into the granite itself; but at Perry Park, a few miles north of Colorado Springs, and at Manitou the sedimentary series is continued, and still lower rocks appear below the red beds and between them and the granite. These are for the most part paleozoic limestones and sandstones of the Lower Carboniferous, Silurian and Cambrian periods. Some of these limestones near Manitou of a drab yellow color are exceedingly fine-grained, and besides make excellent quicklime. Portions of them might be found fine enough for the much valued and universally scarce lithographic stone, suitable for lithographic purposes. For years a locality in Germany has had a monopoly of this valuable stone, but now it is being quarried at some point not known to us, between Colorado Springs and Cañon City, and shipped over the world. So a limestone which in one place may be fit for quicklime or for a flux, in another may be pure and fine enough for lithographic purposes, and in yet another pass into beautiful marble.

Beautiful Marbles.—This change as regards marble is remarkably exemplified some five miles north of Cañon City, or Oil Creek, where a whole mountain of paleozoic limestone over a mile in length by more than 1,000 feel in thickness has been completely changed into some of the loveliest and most delicately tinted marbles the writer has ever seen. The prevailing tints are a delicate lavender streaked with that bronze yellow color known to upholsterers as "old gold," and changes of this with chocolate, dove-colored and white. It is safe to say the entire mountain is one inexhaustible deposit of exquisite marble. Again the same remarkable feature is observed at the head of Yule creek and on Crystal river, far into the mountains, near Crested Butte, in the Gunnison region. There a huge mountain presents on one side a massive perpendicular cliff. The topmost strata formed of the finest kind of white statuary marble, equal it is said to the Parian, 200 feet thick, and in blocks of any dimension. Below this come black marbles and clouded gray and dove-colored marbles of exquisite hue, cloudings and markings, while the base of the cliff is completed by grass-green, serpentine-veined with white. This marble, as well as the one at



The above drawing shows the formations on the eastern side of the rockies in Colorado. The upheaval of the mountains tossed the strata up as shown. If one were to dig down at a point in the extreme right of the drawing he would pass through all the strata if he went deep enough. Nature has saved this trouble by the tossing up process. That is what gives Colorado the remarkable collection of coal, stone, fire clay, marbles, etc., to be found along the eastern edge of the mountains.

Cañon City, is among the most notable and vast undeveloped resources of Colorado, for from neither locality as yet has a very large amount of marble been shipped, and yet we may safely say there are here in unlimited quantities the finest marbles in the United States, if not in the world. Chocolate and variegated marbles occur at various points in Colorado.

Granite Building Stone.—The Silurian and Cambrian strata bring us at last directly onto the crystalline granite shore-line on which these sedimentaries were deposited. They bring us, too, into the realm of the developed as well as undeveloped precious metal resources of Colorado, which must be treated by themselves. But the granite itself is a most important and little developed resource. Up along our cañons and far into the depths of the mountains we find magnificent developments of massive building stone granite, both gray and red. Up the Platte cañon, for example, are mountain masses of red granite like that of Aberdeen, while at the so-called "New Aberdeen" quarries near Gunnison City are masses of fine-grained, homogeneous gray granite from which the Denver capitol building is built, and though thousands of tons were quarried here the quarries look like mere scratches on the rocks, so vast is the supply of this most durable of building stones. The quarries at present lie idle—another "undeveloped resource" of Colorado.

Roofing Slate.—While on the subject of stone material we must not omit the few deposits of roofing slates we have. These deposits are few in number. One occurs on the road between Ironton and Ouray, in the Algonkian rocks; the other is at Treasury mountain, at the head of Yule creek, close to the marble beds. Here is a whole mountain of slates that has been altered by heat from marine Cretaceous shales. It is not uncommon to see traces of the marine fossil shells in the same crystallisne lates. This so far is a wholly "undeveloped resource" which deserves looking into.

We have thus far given careful attention to the section of sedimentary rocks of the foothills for their own value, and in the next place because this same section is repeated again and again in the parks and valleys in the heart of the range and in the region on the western slope of the range and similar products with certain important additions may be found in those remote regions also.

Mexican Onyx.—At Steamboat Springs are unquestionably the most varied, wonderful and medicinal springs, both hot and cold, sulphurous, chalybeate and soda, nice and nasty to be found in Colorado or the West. They are located in Cretaceous strata by the banks of the river and have built around their orifices great banks and cisterns of lime like those in the Yellowstone Park. The same springs have produced large bodies of a beautiful alabastrine substance known as Mexican onyx, like that famed product. These are not even kuown, still less developed. Steamboat Springs is a most desirable watering place and as a resort may be counted among Colorado's choicest "undeveloped resources." *Arthur Lakes.*

Asst. Editor *The Colliery Engineer and Metal Miner.*

THE WASHINGTON MONUMENT.

THE distance at which the monument is visible has always been a matter of debatable interest with Washington people, says the Washington *Star.* Not a train approaches the city, not a boat speeds up or down the Potomac, but carries a group of people anxious to see at just what point they can last see the white marble against the sky as they depart or first find it as they return.

Probably the greatest distance at which the monument is seen is from the summit of the Blue Ridge at Snicker's Gap, a distance of about 43 miles in an air line. The elevation there is 2,000 feet above the Potomac. The mountaineers, years ago, with keen eyes trained to long and sharp sight in the mountains, detected the white spot gleaming on the horizon, and they can always quickly determine its place on the horizon line. But to city folks, however, the location of the white shaft is not an easy matter. Thousands of Washington people every summer invade that region as summer boarders, to subsist on fresh milk and fried chicken, and incidentally in their excursions up on the mountain to get a sight of the monument. On clear days it is distinctly visible, especially to those who are familiar with its precise location. But it is more easily seen at sunset than at any other hour, as the sharp reflection of the sun's rays brings out the white surface of the marble. The mountain people are only too glad to point out the monument to their visitors, and usually tell them the secret by which they can themselves locate it.

This is by finding first on the horizon line the slight elevation of contour

presented by Munson's Hill. Then slightly to the left, perhaps one degree, there it is.

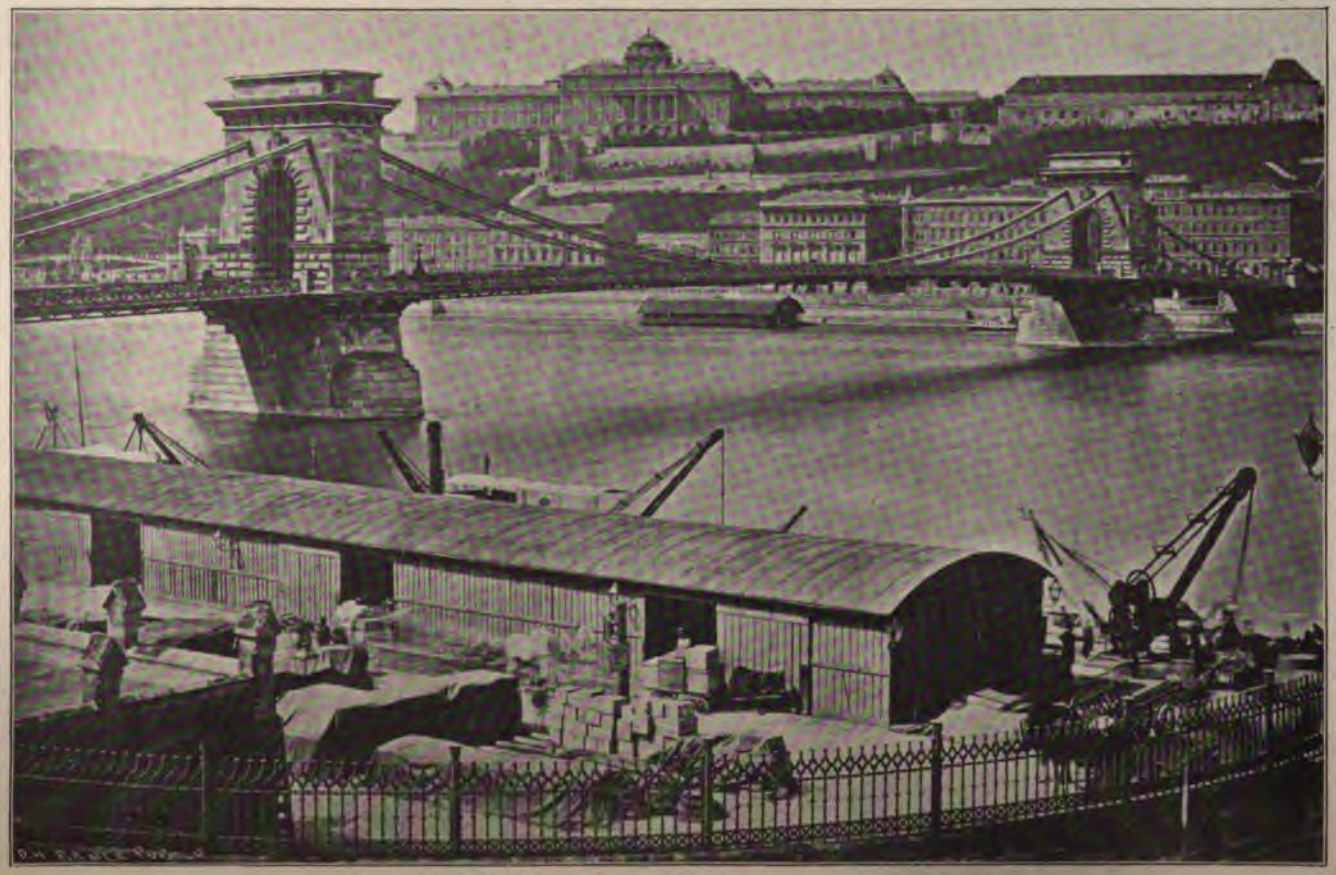
One of the most singular stories that may be told about the Washington monument is hardly creditable, yet it can be vouched for as perfectly true. There are hundreds of ladies in Washington who wear upon their hats the plumage or the entire skin of a bird which has lost its life flying against the tall mass of marble in the dimness of twilight or daybreak. Every morning one of the watchmen who spends the night in the monument finds about its base quite a number of birds who have lost their lives in this way. This mortality is not limited to any one species, but includes nearly all the birds known in this region. Strange to say few English sparrows lose their lives by flying against the monument, but the beautiful golden finches, cedar birds, starlings, tanagers, grosbeaks and many others of bright plumage and great rarity have been found. The watchman takes these birds uptown to a taxidermist, who stuffs and mounts the rarer specimens, which are sold for a good round price to collectors, and the skins of those less rare prepared for the milliner. Hardly a morning comes that there are less than a score of dead birds about the base of the shaft.

Another queer thing to know about the monument is that its height and width vary. It is taller in summer than in winter, and in the latter season its width on the south side is about an inch greater than on the north, east or west side. This is due to expansion under the heat of the sun's rays. This phenomenon was determined by Captain Greene, during the erection of the shaft. Plumb lines were hung at each corner of the marble wall, and the plumb "bobs," or plummets, were suspended in pots of glycerine or molasses. Across the top of each pot was laid a finely graduated steel bar, and three times a day an army engineer "took off" the registration thus made of the expansion of the walls. It was held that the plummets moved precisely with the points at which the plumb lines were attached to the top of the shaft, and the glycerine held them firmly without vibration or oscillation, so that the officers could note any change of position. All these registrations, twice a day every day in the year, were recorded in a book during the seven years that were occupied in finishing the monument.

COLORED SCULPTURE.

FORM gives expression action, motive, grace. In short, the purpose is in form. We know what is meant by form, whether it be a man, a house, or a dog; and we know what any of these mean particularly by the particular form or arrangement of their general form when we see them. A man when about to strike presents to our view one arrangement of his form, when about to leap another, when about to ward a blow anoth-

er, and so on. His face presents one form when he smiles and another when he weeps. Anger effects a new combination or form of the features of his face; and this, as far as it be, is the case with animals generally. Rocks, trees, edifices, etc., cannot be said, properly to have any other expression than that which is peculiar to inanimate things; but they may have expression by resemblance to animated beings. A rock may look like the head of man, and thus have a borrowed expression; and so with the others. I have seen clouds look "very like a camel," and even "like a whale." Thus it would seem that the spirit, or what is vital, reveals itself and its purposes through form, and as the form is so will be the revelation. The form enacts what the spirit dictates. It is the telegraph, so to speak, of the soul which moves it. There can be no change of expression or character without motion, and no motion without a something which moves. This something, whatever it be, is a form, or part of a form of forms. It follows that form is the vehicle of expression. Having attempted to show what is the office of form in act, fewer words are needed in defining that of color. We may mistake for the moment a well-executed wax figure for a living human being, but we never mistake a statue of whatever excellence. And why? The first presents to our senses not only the form of a man, but his very flesh, eyes and hair. The second gives us his form only, and therefore, however expressive it may be, and however like to some individual, it is not illusive. The one appears to have a fleshly body; the other, as it were, a spiritual body. The one appears to have a soul in the flesh, the other appears to be an abstract soul. Form shows how a thing is made, color shows of what it is made; but the latter has no expression, and sometimes fails to show us of what a thing is made. A board painted flesh-color would not look like a piece of flesh, nor would a similarly colored piece of wax, if flat, square or round, but mold it into the form of an arm, a hand, or a face, and instantly you suggest the thought of flesh. Giving it form, has given it expression, to which the coloring has become a suitable accompaniment. Color, then, produces illusion, and is suggestive of matter or substance, and is beautiful and attractive, or otherwise, according to its arrangement or purity. The painter, then needs form; but does the sculptor need color? Color the Apollo Belvidere and he ceases to be a god, a spiritual embodiment; he steps down from his throne on high, and becomes man among men; we touch him, talk to him, and handle him with familiarity. And if this is so with one statue, it would be so with all, if all were equally perfect. When Sculpture calls upon her sister Painting for aid, she acknowledges her weakness, drops the chisel, takes up the pallette, and pursues a mongrel art, half sculpture, half painting,—the one confessedly imperfect, or it would not have required the other, and both together a decided failure, since without glass eyes and natural hair even illusion is wanting.—*London Architect.*



CHAIN SUSPENSION BRIDGE, BUDA PESTH, HUNGARY.

MASONRY FOR BRIDGES.

N this country the availability of materials in the design of substructures for bridges has been a paramount question for years.

As the means of transportation have increased, more attention is being paid not alone to the strength and durability, but also to the beauty of piers and abutments to carry the steel superstructures, which have reached as near a scientific perfection as is perhaps practicable.

Years ago when our engineers were endeavoring, with the limited finances at their command, to build the best masonry they could, paying but little attention to beauty, the engineers of England and on the Continent were vieing with one another in the architecture of the masonry for their bridges.

The chain suspension bridge at Buda-Pesth, built by W. Tierney Clark in 1838, is notable for the enduring construction and the architecture of the granite abutments and towers. On the abutment parapets are toll houses of classic design and huge lions guard the entrance. The towers are rich in detail—on the balconies, on the arch stones, and on the entablatures.

The great Britannia bridge over Menai Straits, built by Robert Stevenson in 1846, is also notable for the imposing character of its masonry. The abutment parapets are terminated by collossal couchant lions similar to those at Buda-Pesth. Each figure is 25 feet in length, 12 feet high and weighs 30 tons.

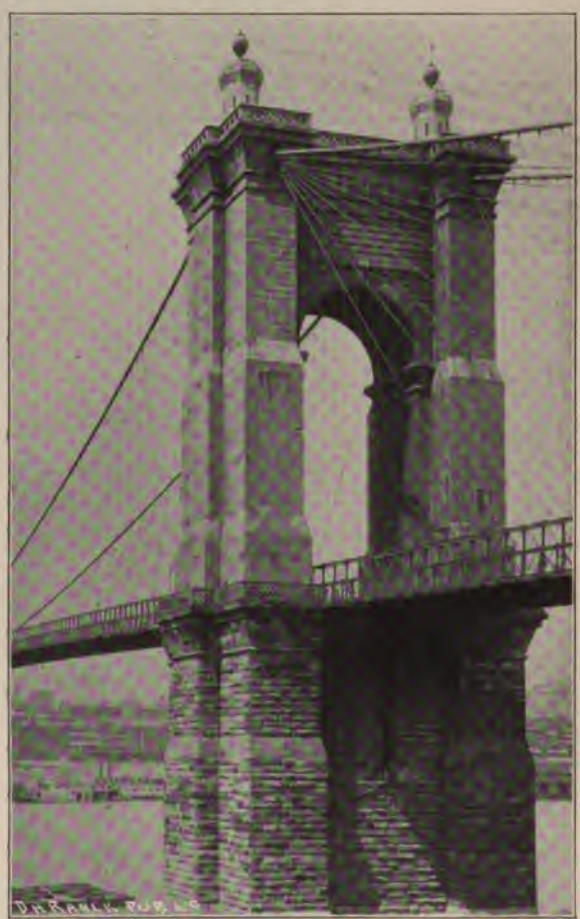
Examples in great number could be drawn from foreign practice, but the great strides made in this country since the civil war have given us many notable pieces of bridge architecture. C. Shaler Smith once remarked to one of his assistants, that most structures were examples of what not to do. And it was no doubt due to this trying to do something better than had been done, as well as better financial conditions, that led to such rapid improvement in the character of our engineering architecture.

One of the first notable bridges to be completed after the war was the Roebling suspension bridge at Cincinnati, and the towers which were constructed of Buena Vista (Ohio) sandstone, laid in a natural cement, are remarkable for their strength and their fitness as a part of a noble design. So well were they constructed that a heavier superstructure is now being built upon them, and a great piece of architecture is to be preserved.

The towers of the Brooklyn bridge are perhaps the most imposing pieces

of bridge stonework we have in this country, and were it needful to criticise their architecture, it would be to deplore the lack of a more gleasing entablature or suitable finish.

The abutments and piers of the Washington bridge in New York may be fittingly referred to as the most beautiful and most complete in architecture of any substructure work on this continent and will certainly bear comparison with any European examples.



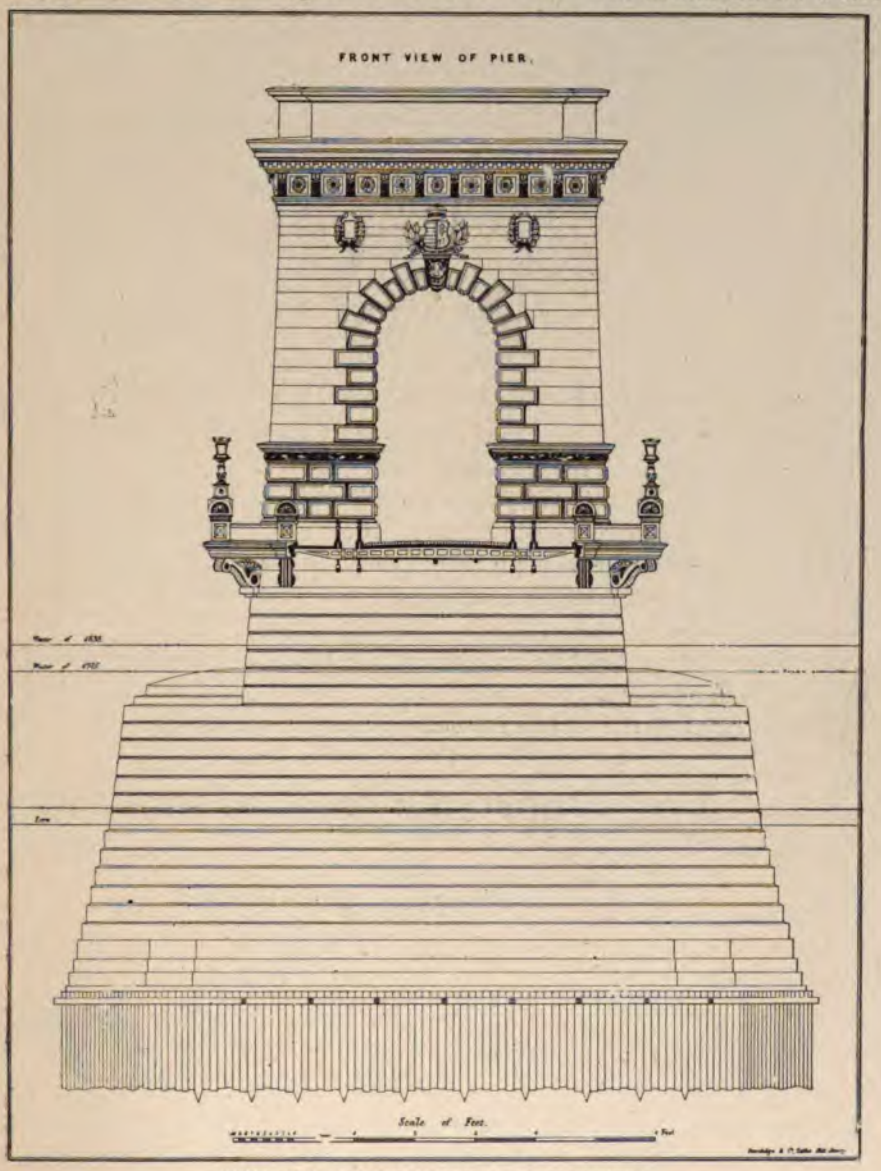
SOUTH TOWER, CINCINNATI SUSPENSION BRIDGE.

In the desire to do something better a great improvement has also been brought about in the more ordinary classes of work, and it may be wise to apologize for making the same mistake our text book writers have done in saying too much about the big structures and leaving the small ones to take care of themselves.

The engineer who has to deal with the smaller construction will do well to study the ideas expressed in the greater works, but as a first consideration assure himself of the entire durability of the stone at hand. Testing machines are convenient for use in almost every locality, and the strength of stone to be used may easily be ascertained. The weathering qualities may be judged to some extent from the texture and composition of the stone, but if it is of an uncertain structure it is best to learn how it has weathered in actual use in other work. If the least doubt remains as to its fitness do not hesitate to substitute a stone of known value.

Of not less importance is the exercise of care in having the stone laid on good beds in good cement mortar.

A park board not long since decided to have the abutments for a steel

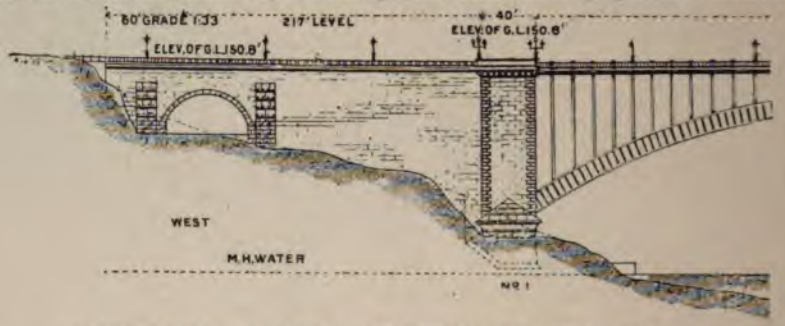


BUDA PESTH SUSPENSION BRIDGE TOWER.

arch bridge laid up dry, because the officials had seen poor cement joints and concluded that all cement joints were to be avoided. It was called to

their attention that it was due to poor workmanship, and they were finally persuaded to use Portland cement mortar and with proper inspection excellent results were obtained.

The ornamental should be a consideration for serious study in every structure to be erected in our cities, parks, and more populous districts.



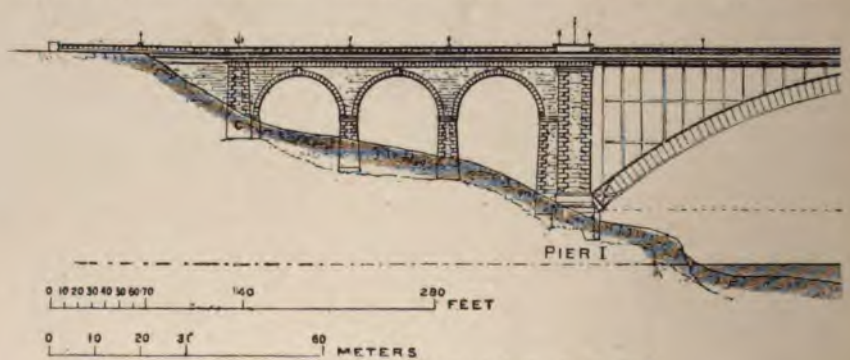
WASHINGTON BRIDGE, NEW YORK—CONTRACT DRAWING.

But mere ornament will not atone for a lack of harmony in the design, nor a lack of harmony with the surroundings.

An arch bridge of several spans should have an odd number, as an opening at the center is more pleasing than a pier. The abutments may often be relieved of a heavy appearance by the introduction of short arches; as is well illustrated by the Washington bridge abutments as built and as shown in the contract drawing.

By ornament must not be understood a multitude of frivolous detail, but a studied amount which is suitable, effective and imposing.

After selecting the class of stone which is to be used, adopt a style of



WASHINGTON BRIDGE, NEW YORK, AS BUILT.

detail which can be successfully carried out. Do not try to use carvings on sandstone or limestone, which would only be possible on marble or granite. Above all, remember that the essence of true beauty is simplicity and harmony.

C. E. Fowler, C. E.

VALUE OF DIFFERENT KINDS OF STONE PRODUCED IN 1894 AND 1895.

VALUE OF SLATE PRODUCT, BY STATES.

THE following table shows the output of roofing and milled slate in 1895:

Value of slate product in 1895, by States.

State.	Roofing slate.		Other purposes (value).	Total value.
	Squares.	Value.		
California	1,500	$10,500	.....	$10,500
Georgia	2,500	10,675	.....	10,675
Maine	23,744	118,791	$21,363	40,154
Maryland	13,188	59,157	1,200	60,357
New Jersey	200	700	.....	700
New York	13,624	90,150	1,725	91,875
Pennsylvania	426,687	1,437,697	210,054	1,647,751
Vermont	221,359	531,482	93,849	625,331
Virginia	27,095	92,357	19,000	111,357
Total	729,927	2,351,509	347,191	2,698,700

The table shows a total output of 729,927 squares of roofing slate, valued at $2,351,509. The corresponding totals for 1894 were 738,222 squares, and $2,301,138. It is evident that, although the number of squares produced is somewhat less in 1895, the value is greater, showing an increase in the value per square, namely, from $3.11 in 1894, to $3.23 in 1895.

This gain in value per square is not what would be expected as the result of reading statements made by many of the producers, who claimed that prices had fallen since 1894. Taken as a whole, the slate industry is in better condition than it was a year ago. The following table shows the average annual price per square of roofing slate since 1890:

Average annual price per square of roofing slate for the entire country.

1890	$3.34	1893	$3.55
1891	3.49	1894	3.11
1892	3.58	1895	3.23

THE SLATE INDUSTRY IN THE VARIOUS STATES.

California.—While the production of slate in California has never yet reached large proportions, the product has always commanded a good price. The demand for slate as a roofing material is curtailed by the cheapness and excellence of redwood shingles produced in the state. There is no reason at present to expect that the production of roofing slate will increase mark-

edly within the next few years. The output comes entirely from Eldorado county.

Georgia.—The output of slate in Georgia has been about the same for the past five years, with the exception of 1894, when it reached a total of 5,000 squares. In 1895 the total was 2,500 squares, but indications for steady improvement are better now than they have been, as the producers are better prepared than formerly to fill orders promptly. There seems to be no reason why the production of slate in the South should not prosper, for the material is good and should supply the whole Southern trade, both for roofing purposes and manufactured articles or milled stock. The entire output comes from Polk county.

Maine.—Quarries in Piscataquis county yielded an output valued at $140,154. Of this value, $118,791 represents the value of 23,774 squares of roofing slate, while the remainder is the value of milled stock. The roofing slate commands a price well above the average for the country.

Maryland.—Productive quarries are all in Harford county, near the Pennsylvania state line, and form a part of what is known as the Peach Bottom region. The product has always been favorably regarded for roofing purposes, and the price per square is higher than the average for Pennsylvania slate.

New Jersey.—The slate produced in this state comes from Sussex county, and the quarries form a continuation of the Pennsylvania slate belt. Production on the New Jersey side of the line has never been very considerable.

New York.—The output of 13,624 squares of roofing slate, valued at $90,150, comes from Washington county, near the Vermont line. Most of the product is of a bright, cherry-red color, and as it is the only slate in the country of this color it commands a high price. Used with black slate, it forms a very pleasing combination in the roof.

Pennsylvania.—The value of the slate output in Pennsylvania amounts each year to more than half of the total value for the whole country. The productive counties are Berks, Carbon, Lehigh, Northampton and York. There is very little difference between the years 1894 and 1895 in total output, but it is interesting to note that the average value per square has increased from $3.35 in 1894 to $3.39 in 1895. This difference is not great, to be sure, but it is sufficient to indicate an improvement, which will probably continue in 1896, as the general prosperity of the country increases in its recovery from the depression of the past few years.

Vermont.—This state is second only to Pennsylvania in the production of slate. The product comes from Rutland county and differs from Pennsylvania slate in color, the latter being entirely black, or nearly so, while Vermont slate is of various shades of green and purple. Vermont slate is easily

and cheaply quarried, and the indusrry can be successfully prosecuted at lower prices per square than in any other state. There has been but little change (a slight increase) over 1894, but as is true in Pennsylvania also, indications for improvement in 1896 are good. The average price per square in 1894 was $2.12, while in 1895 it was $2.40.

Virginia.—The output comes from Buckingham county. Although there was a slight decrease in output in 1895, it is hardly sufficient to be significant. The production of milled stock is of recent date, but seems to be firmly established as a permanent addition to the industry in the state.

William C. Day.

MEDIÆVAL EMPLOYMENT OF STONE.

IF the early Gothic builders used soft stones for their points of support (as they were often forced to do in default of finding others), they took care to leave them a great height, of course, for in tihs case soft stone is less liable to be crushed. As to hard stones and among others the thinnest, which are generally the strongest, they used these as ties, as lintels prolonged to connect distant piers with one another, and they formed the supports which were to carry a heavy burden either by piling the stones one upon another, if these supports were very thick, or by setting them upright against their stratum, if the supports were very slender. With regard to these stones set against the stratum, we recognize all the delicacy of observation shown by the builders. They were not ignorant that stones set against the stratum are liable to split; wherefore, they chose them with particular care with shallow, very homogeneous and very compact ledges, in the building stones at Paris, in the hard stones at Tonnerre, in Lower Burgundy, and Champagne, in the small ledges of upper Burgundy, hard as sandstone and without strata. Experience had shown them that certain stones that were hard and fine in grain, like the "Cliquart" and the small, hard ledge at Tonnerre, for instance, were composed of very thin courses of limestone set one upon another and united by solid cement; that these stones through their very texture have, when set up against the strata, so to speak, an extraordinary strength; that they resist enormous pressure, and that when heavily loaded with a powerful weight they split less readily than if set on their natural bed, for what makes these stones split is the moisture which they secrete between their thin layers, and which causes the particles of marl to swell; now if set flat they are more apt to preserve their moisture than if set upright. In this latter case the water runs along their sides and does not penetrate the courses resting one upon another. As a proof of this statement we might cite a number of gutters, drip-stones and copings made of slabs of lias or cliquart set on their natural bed in very old buildings, and frequently found to be split; while the same materials in the same structure

when set upright against the stratum are perfectly preserved and are injured only through accidents, like the oxidation of cramp-irons or gudgeons, or through some flaw. We should not omit here one important fact in the constructions of the Middle Ages, that the beds are cut with the same perfection as the facings to be left in sight, and that the stones are always set in a thick bed of mortar and do not have the mortar put in with a trowel, or poured in, which is worse.—*The Architect, London.*

USEFULNESS OF VARIOUS KINDS OF STONE FOR HIGHWAYS.

A MOST important matter to consider in the choice of stone for road metals, in highway work, is its resistance to weather and friction. The amount of traffic, the value of the material considered simply as material, independent of price, and the price itself, are the three elements to be carefully determined and weighed with and against each other. German statistics are not wanting to show the comparative resistance of various road materials to wear caused by similar conditions.

Taking as a standard 1 cubic meter = 1.3 cubic yards of basalt with a crushing strength of 1,500 kilograms per square centimeter (21,335 pounds per square inch) the equivalent necessary quantities of other stones are as follows:

Crushing Strength.		MATERIAL.	Proportionate quan required (cu. m. or cu. yds.)
Kg. per sq cm.	Lbs. per sq. in.		
1,500	21,335	Basalt	1.
1,400	19,912	Basalt	1.08
1,300	18,490	Diorite; aphanitic greenstone, melaphyr or angite porphyry, gabbro	1.20
1,200	17,068	Granite, syenite, compact quartz porphyry	1.32
1,100	15,645	Porphyry of the granite group	1.59
1,000	14,223	Quartzy graywack millstone grit	1.84
900	12,801	Graywack	2.15
800	11,378	Quartzy limestone, compact new red sandstone	2.57
600	8,534	Jura limestone	4.00
500	7,112	Jura sandstone	7.00
400	5,689	Chalky limestone	12.00

The extraordinary decrease in durability compared with crushing strength shows the necessity of great care in testing and choosing stone for road-metaling purposes.

In the table, average values are given; and the conditions of climate, traffic, etc., are the same in all cases. Under different other conditions it may be said that the differences in durability are less, the less the traffic and the more favorable the weather and the position of the road.

With good weather conditions, favorable position as regards dampness, and light traffic, more attention should be paid to cost than when contrary conditions prevail.—*Robert Grimshaw, C. E., in Municipal Engineering.*

CORRESPONDENCE.

[Regular Correspondence STONE.]

NOTES FROM ABERDEEN.

To the Editor of STONE:

SIR:—Since I last wrote this city and district have been visited by a severe snowstorm. The blizzard which ushered in the cold snap was the worst experienced in Aberdeen within the memory of man, while in the inland districts roads became impassable, and railway and telegraphic communication was for a time cut off. All the quarries had to shut down for fully three weeks. Frost compelled building operations to cease, and even in the monumental works in the city operations were seriously interrupted. In fact for a few days they were suspended altogether, and during that time all the employes in every branch of the granite trade were thrown idle. This interruption will make the whole busy, now that the thaw has come—exceptionally so in the building trade. Owing to the storm, there is little or nothing in the way of news to add to my last letter.

At the annual meeting of the Aberdeen Granite Association a motion will be made to rescind the agreement between that body and the Boston Wholesale Dealers' Association. It is expected that the motion will be negatived. Under the existing rules the present president is ineligible for re-election at this time. A proposal will be made to amend the rules, but in the event of its being lost there will be competition for the office. The balance at the credit of the Association is rather less than last year.

There are numerous hospital schemes in hand to commemorate the British queen's "Diamond Jubilee." The city of Dundee has raised all the funds required for a statue of the queen, and the town of Berwick-on-Tweed is to erect a polished granite memorial fountain to cost £500 sterling. HEATHERBLOW.

Aberdeen, Scotland, Feb. 15, 1897.

THE quarries, mill and cutting plant formerly belonging to E. deForest Simmons, and previous to his ownership operated by the Piedmont Marble Company, located at Marble Hill, Pickens county, Georgia, have been turned over to a new organization known as the Marble Hill Quarry Company. The new company was incorporated under the laws of the state of New Jersey on Jan. 26, 1897. There are five directors, as follows: Jesse D. Abrahams, E. deForest Simmons, F. C. Poucher, Dr. James A. Bennett, of New York City; J. C. Davis, of Maplewood, N. J.

The officers chosen were as follows: Jesse D. Abrahams, president; E. deForest Simmons, vice president; F. C. Poucher, treasurer; J. C. Davis, secretary.

Mr. Abrahams was formerly deputy comptroller of the currency at

Washington, D. C. Additional capital has been invested and the property will be fully developed. In the meantime measures will be taken to place the product in the markets of Northern and Western states. There are three quarries of white marble opened, from which over 150,000 cubic feet of merchantable stock has been produced and cut in the last couple of years. Very recently a deposit of pink marble was uncovered, and the property will therefore be thoroughly developed.

PERRONET'S METHOD OF STRIKING CENTERING.

IT is a delicate business to strike the centering of bridges. Were it removed in an instant all would probably come down, for the arch-stones are not yet abutting on each other, and the joints in the middle are open below. Perronet's method appears to be very judicious. He began to detach the centering at the very bottom, on each side equally, where the pressure on the centering is very slight. He cut away the blocks which were immediately under each arch-stone. He proceeded gradually upwards in this way with some speed, till all was detached that had been put out of shape by the bending of the centering. This, being no longer supported, sunk inward, till it was stopped by the abutment which it found on the arch-stones near the crown, which were still resting on their blocks. During part of this process the open joints opened still more and looked alarming. This was owing to the removal of the load from the haunches of the centering. This allowed the crown to sink still more by forcing out the arch-stones at the haunches. He now paused some days, and during this time the two haunches, now hanging in the air, gradually pressed in toward the centering, their outer joints closing in the meanwhile. The haunches were now pressing pretty hard on the arch-stones nearer the crown. He then proceeded more slowly, destroying the blocks and bridgings of these upper arch-stones. As soon as he destroyed the support of one, it immediately yielded to the pressure of the haunch; and if the joint between it and the one adjoining toward the crown happened to be open, whether on the under or the upper side, it immediately closed on it. But in proceeding thus he found every stone sink a little while it closed on its neighbor; and this was like to produce a ragged soffit, which is a deformity. He therefore did not allow them to sink so much. In the place of the blocks and bridgings which he had cut away he set small billets, standing on their ends, between the centering and the arch-stones. These allowed the pendulous arch to push toward the crown without sensibly descending, for the billets were pushed out of the perpendicular, and some of them tumbled down. Proceeding in this way, he advances to the very next course to the keystone on each side, the joints closing all the way as he advanced. The last job was

very troublesome, viz. the detaching of the three uppermost courses from the centering, for the elasticity of the centering was now trying to unbend and pressing hard against them. He found that they were lifted up; for the joints beyond them, which had closed completely, now opened again below; but this job was finished in one day, and the center sprung up 2 or 3 inches, and the whole arch sunk about 9 inches. This was an anxious time, for he dreaded the great momentum of such a vast mass matter. It was hard to say where it would stop. He had the pleasure to see that it stopped very soon, settling slowly as the mortar was compressed, and after one or two days settling no more. This settling was very considerable, both in the bridge at Neuilly and in that at Mantz. In the former, the sinking during the work amounted to 13 inches. It sunk 6 inches more when the blocks and bridgings were taken out, and one and a half when the little standards were destroyed, and one and a fourth more the next day, so that the whole sinking of the pendulous arch was 9½ inches, besides what it had sunk by the bending and compression of the centering. The crown of the centering was an arch of a circle described with a radius of 150 feet; but by the sinking of the arch its shape was considerably changed, and about 60 feet of it formed an arch of a circle whose radius was 244 feet.

A BOOM IN SLATE.

AN undeniable trade improvement has taken place in slate. For more than a year past the export trade has been rapidly growing, and since last summer, when a number of gentlemen went to England in the interests of the American quarries, to exhibit specimens of our manufacture great shipments of roofing, blackboard and structural slate have been made, while very fine billiard table beds have been shipped and a demand has been created for that product abroad.

On March 20 there will be an exhibition at the Agricultural Hall, London, by the Builders' Trade, and an entire department of the building will be devoted to American slate. It will contain the finished products of American slate quarries, mills and factories, and will contain really magnificent specimens, which will open the eyes of leading men in the slate trade in the old country to the value of our great slate beds.

"We regard STONE as the leading magazine in the granite, marble and stone interests."—*Peter & Burghard Stone Co., Louisville, Ky.*

OUR FOREIGN TRADE IN STONES, ETC.

From the summary statement of the finance, commerce and immigration of the United States, corrected to February 1, 1897, we compile the following:

ARTICLES.	DECEMBER.				12 MONTHS ENDING DECEMBER—			
	1895		1896		1895		1896	
Imports—	Quan.	Values.	Quan.	Values.	Quan.	values.	Quan.	Values.
		Dollars		*Dollars*		*Dollars*		*Dollars.*
Cement, Rom., Portland & other hydraulic..lbs	84,128,175	262,581	55,786,610	184,047	1,198,958,147	3,873,123	1,067,070,658	3,393,199
Cement, imp. from (lbs.:								
United Kingdom	31,022,366	99,267	10,614,194	34,714	322,753,858	1,014,316	254,470,209	815,059
Belgium	23,122,750	60,734	13,258,908	38,369	283,549,005	865,687	274,891,686	800,285
France	471,871	1,212	354,600	1,086	9,134,967	27,842	18,666,473	51,918
Germany	29,198,348	94,969	30,270,774	104,809	519,967,389	1,737,442	491,312,903	1,623,332
Other Europe	1,275,350	6,107	1,218,244	4,769	56,763,527	201,576	22,890,667	80,980
British North America	37,500	292	70,009	300	4,166,561	18,894	3,757,100	15,989
Other countries					2,622,240	7,366	1,221,600	5,652
Total	84,128,175	262,581	55,786,610	184,047	1,198,958,147	3,873,123	1,067,070,658	3,393,199
Marble, and mfrs. of		84,125		40,485		865,243		808,030
Stone, & manufactures of, including slate		38,972		23,755		411,122		387,979
Total		123,097		64,240		1,276,365		1,196,009
Exports—								
Marble and stone, and manufactures of:								
Unmanufactured		3,593		7,053		71,873		72,860
Manufactures of—								
Roofing slate		16,427		72,859		84,599		515,058
All other		41,280		39,963		803,400		568,133
Total		61,800		119,875		959,871		1,156,051
Cement.....bbls			4,476	7,263			54,639	86,757
Exports foreign mdse.								
Cement, Rom., Portland & other hydraulic...lbs	289,975	1,214	259,063	974	3,578,230	13,895	4,437,261	16,558
Marble, & mfrs. of		1,158		512		2,117		3,517
Stone, & mfrs of including slate		846		1,209		4,881		10,710
Total		3,218		2,695		20,893		30,795

Merchandise Remaining in Warehouse on December 31, 1895 and 1896, Respectively.

ARTICLES.	December 31—			
	1895.		1896.	
	Quantities.	Values.	Quantities.	Values.
Cement, Roman, Portland, etc.....lbs...	6,640,136	$ 20,119	11,667,479	$ 33,144
Marble and stone, and manufactures of:				
Marble, and manufactures of		67,486		24,242
Stone, and manufactures of, including slate				360
Total	6,640,136	$ 87,605	11,667,479	$57,746

Imports of Merchandise from Foreign Countries.

ARTICLES.	YEAR ENDING JUNE 30—									
	1872	1875	1880	1885	1890	1891	1892	1893	1894	1895
Belgium—										
Marble and manufactures of		$2,026	$10,825	$10,428	$46,277	$38,657	$69,448	$95,491	$33,408	$18,225
Stone and manufactures of, including slate				1,800	3,737	3,074	2,344	7,087	7,450	4,335
France—										
Marble and stone, and manufactures of		90,084	32,268	15,400	65,783	105,230	157,273	114,674	97,174	76,550
Germany—										
Marble and stone, and manufactures of		55,001	50,528	63,054	40,483	24,995	24,146	18,182	13,022	14,122
Italy—										
Marble and manufactures of	$483,182	606,214	505,456	494,323	512,956	581,983	586,192	700,827	618,278	635,985
Stone and manufactures of, etc				84	128	412	1,039	3,776	5,543	1,689
United Kingdom—										
Marble and stone, and manufactures of	315,066	380,539	113,855	174,985	401,718	465,047	404,483	507,237	419,643	327,230

TIMELY TOPICS

The Blacklist Again. STONE has stood alone among the publications of the stone, marble and granite trades in opposition to the confidential list, or, as we have not inaptly termed it, the blacklist, as it is handled by the Granite Manufacturers' Protective Association of New England. Our position is reinforced by a notice just received from Townsend & Townsend, and Wm. C. Townsend, of New York, members of the Association, that they have decided, after consultation with eminent attorneys at law, to withdraw all names placed by them on said list. This furnishes us a text for further argument. STONE has not criticized the Association for having such a list, but solely for the manner in which they use it, and so using it as we have cited, to place the Association in contempt of the law, by its assumption of functions that belong solely to courts of justice. We cannot admit that such an association may try a case between one of its members and his customer, on strictly a question of legal responsibility of one to the other, and not guarantee each of the parties equal privileges before its bar. Let us state our understanding of the procedure followed by this bogus "court."

Prefatory: There are local associations, such, for instance, as at Barre, Quincy, *et. al.* These local associations make up the general protective association we have named.

The Procedure: A manufacturer at Barre comes into controversy with a retail dealer in monuments in Indiana. There is a dispute over prices or quality of work, and they can't agree, and the retailer refuses to pay the bill made out against him. The member of the local association reports the name of the delinquent debtor to the secretary of the local association to which each creditor belongs. The secretary presents the case to a committee composed of the president, vice president and secretary of the local association. If said committee decides that the creditor has made out a *prima facie* case, the secretary writes the debtor asking him to send a statement of his side of the case. If he fails to answer for fifteen days, or, if his answer is deemed insufficient by said committee, his name is sent to the secretary of the Protective Association, called the "general secretary," who notifies the debtor that the local committee has decided against him, that he is entitled to an appeal within ten days to the board of arbitration, whose decision is final, and that if no appeal is taken and the claim is not paid he will be placed on the confidential list. If an appeal is taken and the case is decided against the debtor, he is, of course, put on the confidential list, unless he pays.

The local committee which decides the case in the first instance is composed of the creditor's fellow members, in whose selection he has a hand. The board of arbitration, also, which under this scheme has the final decision, is

composed of members who are chosen annually, one by each local association. It is plain, therefore, that the creditor has a voice in choosing both of the tribunals before which the case comes for trial, while the debtor, at least in the case of a retail dealer, has no part in selecting them.

The confidential list, which appears monthly, contains the names of all dealers who have not paid their bills after being given the opportunities to defend themselves as set forth above. After a dealer is placed on the confidential list, he can not purchase from any member of the Protective Association, which comprises practically all the wholesale granite dealers in the country. A retailer, therefore, who is placed on the confidential list is cut off from his whole source of supply and must go out of business. If a member of the association violates the rules and sells to a man on the confidential list, the board of arbitration on proof thereof will report him to his local association, whose duty it is to suspend him from membership and all the privileges of the association, which would in turn cut off his source of supply and drive him out of business.

The broad difference between the local associations and the Protective Association is that the local associations endeavor to regulate the actions of persons inside of the association who were parties to the adoption of the regulations, while the Protective Association endeavors principally to regulate the actions of persons outside of the association who had no part in determining the terms of the regulations, who, in other words, were not parties to the contract. And the Protective Association not only regulates outside parties but undertakes to determine what their legal rights are, whether they consent to such an arrangement or not. As to such outside parties, the Protective Association is illegal—not in its objects but in the way in which it undertakes to carry its objects out.

Every man has a right to have his rights determined in a court of law by a jury of his peers. This right he can waive, but no one can legally deprive him of it without his consent. The ordinary way in which a man waives trial of his case in court is by uniting with the other parties in the controversy in choosing arbitrators. The debtor outside of the association, who receives notice that unless he submits his side of the case to the committee of the local association he will be placed on the confidential list, has had no part in choosing that committee or in choosing the board of arbitration. He has not agreed in any way to be bound by the regulations of the association. The creditor who is trying to force him to submit his case to such committee and board, on penalty of being driven out of business, has helped to choose the members of the committee and has had a part in choosing the members of the board. The injustice of the whole scheme as between a member of the association and an outsider is manifest. A court of equity would enjoin the placing of such an outsider's name on the confidential list without the slightest hesitation. If the association endeavored to accomplish the same result by sending advice outside of the confidential list to individual members, it would be guilty of contempt and the members who authorized or took part in sending such notice would be heavily fined.

What show would the Indiana man have toward saving himself free of financial loss by contesting his suit before a tribunal such as we have described? STONE cannot concede that, as between man and man, the wholesaler is any less

the honest man and good citizen than the retailer is. Most men are of the same stuff when it comes to insisting on rights they conscientiously believe belong to them. There is only one code of laws recognized in this country, and they are framed for absolute justice and the equality of men before them.

We know that the exercise of this list has ruined honest retailers. It has caused many of them almost unbearable trouble and anxiety. Until an association of that character can control the individual actions of its members, holding these to honor's course and away from incentive to gain profit either through misjudgment, sharp practice or downright dishonesty, it should not be allowed to exercise the power of restraining non-members from lawful pursuits.

The "Skyscraper." The *National Builder*, which is good authority on the merits of building materials, says: "If the great skyscrapers built within the last few years, in whose towering walls are embedded huge iron skeletons, should have their metallic ribs and posts attacked by rust, their condition will soon prove a menace to life and limb. We have nothing certain as to the life of skeleton frames, and in these days of electricity there is no telling what destructive agencies may be at work on these hidden frames." Moral: Dispense with the skeleton frames and substitute first-class stone for solid walls—which "neither moth nor rust doth corrupt," nor electricity, wind, frost or fire affect injuriously. The world may not be "breathlessly awaiting" the culmination of the work of the "destructive agencies" hidden in the frames of the great skyscrapers, but it would not be greatly astonished if a collapse of some of them should occur without warning. It has always required some mighty disaster to check the selfish power of wealth or ambition. The standard argument in favor of the tall skeleton-framed and brick-veneered building—that it pays to erect them—cannot stand against the truth that they are unsightly, that they depreciate adjacent property, that they are not fire-proof, that they "are a menace to life and limb," and that they check expansion in building operations; and that they focalize business into overcrowded centers. The skyscraper is a nuisance in many ways. But they will continue to multiply in number until one or two disastrous holocausts come from them.

Cooperation. Coöperation in quarrying and in stone-working has been tried many times, but in most instances the effort has been disastrous in a financial sense. We recall several attempts in this line by practical quarriers and cutters that have apparently been fairly successful, but these were the outgrowth of prolonged lock-ups of the industries, during which the coöperative concerns gained sufficient business to become permanently established, and being managed by experienced business men they acquired a fair standing in the trade. How much has been paid in wages and dividends comparatively to the established wage rate for like work, we have no knowledge, but the presumption follows that the workmen are content, or the companies would not remain intact. In the case of granite paving block cutters, where work is calculated by the piece, it seems that the cutters could, if they would, make a better wage rate than by day labor, always provided the business management is competent. On the success of contracting depends the success of the workmen. The feature of independ-

ence of the individual herein, does not count for much, if he must labor more hours and with added energy to insure to himself his proportion of the profit on his work. And though he may be in a sense his own boss, yet can he be bound by an obligation to himself, being a part of the aggregation, that will be more irksome at times than any restriction the private boss ever held over him. That is because the element of obedience to authority, on which rests his personal welfare, is curtailed. He may not be unwillingly dismissed and shorn of all recovering, but he would likely be hounded and tyrannized over to such an extent that he could not escape unshorn. So, it seems to us that coöperation, where it involves many workmen, is not an ideal existence for the quarrier or stone-cutter.

"Natural Sap." The word *sap* is frequently used in alluding to a freshly quarried stone. If perchance it does not convey a wrong meaning to the reader who is ignorant of the elementary qualities of stone, it is expressive enough, but, we were asked the other day by one in doubt of the correct meaning of the word when used in relation to recently quarried stone, whether stones, like plants, were nourished by "sap," and whether this fluid had to do with the "life" of the product. Now that may strike the practical stone man as a funny question, but if he will recur to his own experience he will doubtless recall his own vague understanding of what "sap" really means. We are all agreed that stone should be thoroughly seasoned before being placed in the wall of a building. We mean by that the stone should be allowed time enough to dry out completely. It is best to carve and mold when still wet. If we deny that it has a "*natural* sap," we must admit that it will not shrink perceptibly as it dries; and, again, that if the pores through which this fluid has run for untold ages are dried up they will become a homogeneous part of the stone and that we will have a compact, close-grained article through which the rain and frost and dust cannot penetrate. As a matter of fact most stones do shrink when seasoned, and the closest-grained specimens will absorb moisture and admit discoloring dirt, unless the "pores" are closed by glazing the surface of the stone, and even then are not entirely impervious. Verily, stones do contain "sap," or a chemical fluid, before they are riven from their natural bed. This quarry water holds in solution a certain amount of chemical constituents that when dried out affect the size and character of the stone. This fact ought to be sufficient to assure builders that it is unwise to place any stone of whatever quality into an exposed building before it is absolutely dry.

A Tombstone Scandal. It has been charged against several physicians in England that they have acted as agents for the sale of tombstones thus, as one paper states it, "taking a toll from death." There are, probably, in England and in other countries as well, "doctors" who would not hesitate to do a little business in gravestones as a side line, if they could keep the transaction strictly private. It grates rather harshly on the refined sentiments of humanity, however, even to think that a physician who has had a human being in his professional care and failed to stay the hand of death, should turn about and try to sell the bereaved friends a monument to the memory of the dead. That's on a par with selling absolution to the soul, against which practice old Martin

Luther hurled his anathemas. Of course no reputable physician would attempt even to traffic in gravestones, but in this report it may be noted that Nordau has some reason for his declaration that mankind is growing degenerate. The insatiate greed for money nowadays has turned loose many Esaus willing to "sell their birthright for a mess of pottage."

Paternalism and Policy. Much has been printed in the press of this country regarding the strike at the great Penryhn slate quarries in Wales. The origin of the discontent among the quarriers was over wages, but the motive for the strike lies in the question whether one may be master of his own property. The trades union is contesting this fundamental right. The strike has gone so far that an act of Parliament is involved, and it is reported that body actually contemplates acquiring the quarries to the government and operating them. If that should be the outcome of the strike it will be the longest step toward paternalism in government affairs yet taken by an English-speaking nation. It would be a blessed thing for our republic to have the experiment of government controlling and operating what has heretofore been controlled and operated as private property first tested in Great Britain. Heaven knows we don't want to undertake to demonstrate the actualities of such a matter here. We are close enough now to the condition where the nation's affairs are handled in a paternalistic spirit—by trades-union methods, if you please—wherein the dominant party regards fealty to its organization and not fitness as the *sine qua non* in distributing the administrative offices. No civil service law reaches them. The man who is not for the party that succeeds must give way to supply a place for the man who wears the label of the victorious party; the skilled artisan who is not of the union must go a-begging that the "organized" man can take his place whether he is fit or unfit. The principle is the same, and both are of the essence of paternalism. It is a principle so weak and so degrading that a republican government would hardly stand long enough to demonstrate the single fact that it is rotten in reason and in morals, if it were applied to the control and operation of the commercial institutions of the country. Did the workingman but know it no greater curse could befall him than absolute paternalism, for under its workings no one, no matter what his natural gifts, could rise above the level of his fellows. The rich would seize and hold power and place while the poor would gradually sink to a state of peonage from which nothing but a revolution could release them. The workingman, particularly if he be a member of a union, persistently refuses to hear any but his side of the question, and that side presented by men who do not hesitate to use the union to further their own selfish ends. In this country there is sent up a great clamor that the government take charge of all railroads, canals, river and lake transportation, all telegraph, water, gas and electric lighting companies, street railways, etc. If the government ever heeds this clamor and does these things such an era of corruption will be inaugurated that the records of Tweed and Tammany will seem white in comparison. Then the individual will be nothing; the boss all.

According to Webster. *Quarrier. n.* A worker in a stone quarry. *Quarryman. n.* A man who is engaged in quarrying stones.

SELECTED MISCELLANY.

INDIAN MORTAR.

IT is pretty generally known that the old native builders in southern India used jaggerry—that is, unrefined sugar—as an ingredient in the composition of mortar, and even the fine Madras plaster was said to have an admixture of tyre—that is, curds.

There can be no question that these are ancient Indian practices and their cause and effect are still matters involved in doubt. Even now we read that babool wood-burned kankar does not require a mixture of unrefined sugar, chopped hemp and myrabollams for preparation of mortar; on the other hand, we learn that cow-dung cakes, which were at one time largely used for the burning of lime, affect the quality of the outturn when used as a building material.

These are curious, if not interesting questions for the economic chemist to deal with, and it is not improbable that some good reasons may be found beneath these popular notions.—*Indian Engineering.*

MEDIÆVAL MOSAICS.

THERE are three great divisions of Italian mediæval mosaics, viz.: 1. The Opus Alexandrinum, made of hard marbles and used for floors; sometimes, but very rarely, small portions of Opus Vermiculatum appear in conjunction with it. 2. The Opus Grecanicum, which is little more than No. 1, only the tesseræ are made of gloss, and it is occasionally found, as in Sicily, with a mixture of hard precious stones, such as porphyry jasper, etc. It is used to decorate church furnishings and the lower parts of walls. The term Opus Grecanicum is sometimes applied to the Opus Alexandrinum, but it is perhaps as well, for the sake of clearness, to confine it to geometrical glass mosaics, set in marble. The base of St. Edward's shrine and the tomb of Henry III. at Westminster Abbey are examples of this sort of work, while the pavements before the high altar of the same building and in St. Edward's Chapel are excellent illustrations of Opus Alexandrinum. 3. Opus Musivum, or figure mosaic proper, where animals, foliage and figures are executed by means of tesseræ made of opaque colored glass. Very many of the Roman churches possess apses decorated in this work, and it is used to cover the whole of the interiors of St. Mark at Venice, and the cathedral at Monreale in Sicily, and the Capella Reale at Palermo.

ELECTRICAL INFLUENCE ON STEAM ENGINE DESIGN.

FOR more than half a century the steam engine has served the innumerable wants of man. The work it was called to perform was of such variety, and the conditions in each case were so different that, of necessity, a great many types of engines resulted. In the vast majority of cases the problem put before the engineer was not, as it should have been, the broad one of converting the greatest possible amount of heat energy into mechanical power, but it was rather the specific problem of obtaining the mechanical power in such form as to be best suitable for general use. As the reciprocating motion of the piston was not convenient for practical purposes, except in very few instances, the piston was connected to a crank, and thus rotating motion was obtained, which was more suitable and preferable, though it in-

volved numerous disadvantages incident to the crude and wasteful means employed. But until quite recently there was at the disposal of the engineer, for the transformation and transmission of the motion of the piston, no better means than rigid mechanical connections.

The past few years have brought forcibly to the attention of the builder the electric motor with its ideal features. Here was a mode of transmitting mechanical motion, simpler by far, and also much more economical. Had this mode been perfected earlier, there can be no doubt that the majority of the many different types of engines would not exist, for just as soon as an engine was coupled with an electric generator a type was produced capable of almost universal use. From this moment on there was no necessity to endeavor to perfect engines of special designs capable of doing special kinds of work. The engineer's task became now to concentrate all his efforts upon one type, to perfect one kind of engine—the best, the universal, the engine of the immediate future; namely, the one which is best suitable for the generation of electricity.

The first efforts in this direction gave a strong impetus to the development of the reciprocating high-speed engine, and also to the steam turbine.

The gas or explosive engine has been likewise profoundly affected by the commercial introduction of electric light and power, particularly in quite recent years. The engineer is turning his energies more and more in this direction, being attracted by the prospect of obtaining a higher thermo-dynamic efficiency. Much larger engines are now being built, the construction is constantly improved, and a novel type of engine, best suitable for the generation of electricity, is being rapidly evolved. —*Nicola Tesla, in Cassier's Magazine for March.*

ARCHITECTURE OF THE NINETEENTH CENTURY.

THE best that can be said of the architecture of the nineteenth century is that it has been an architecture of exceptionally learned, ingenious, and accomplished individualities. It has been an art of experiments which have failed, and of revivals which have been fruitless. These individualities, with their consciousness highly educated and trained, have been embarassed rather than aided by their knowledge of the great achievements of the past. It does not seem to have occurred to them to appeal to the sympathies of the people by uttering their inspirations in the vulgar tongue, but they have labored with immense talent and ingenuity to interpret and apply dead languages. Their efforts have been reminiscent, excursive, and experimental. The architects have analyzed, theorized, disputed, and argued. They have formed schools, conserving classic or romantic traditions—schools which have fallen apart, because progress has been found to be impossible on merely archæological lines. Many of the individualities developed under these conditions have been brilliant and powerful, and have had a great following of lesser men. As the century has advanced, certain of these individualities have been inspired by nobler and loftier motives. The architecture of the century, because it has been nourished in the same soil that produced the electric telegraph, the telephone, and all the other triumphs of industrial art, has exhibited a certain sporadic vitality, and, conscious of the universal energy, has occasionally thrown out mighty branches full of the possibilities of a great fruition; but, because it has not enjoyed the advantage of concentrated effort, it has not flowered as it flowered in the thirteenth and sixteenth centuries, still less as it flowered in the ages of Pericles and Augustus.—*Henry Van Brunt, in the February Atlantic.*

HOW INDIANS ARE NAMED.

AS the Indian child grows he commits acts from time to time each of which gives him a new name. For example he may see a bear and run screaming to the tepee. The folks all laugh at him, and call him Runs-from-a-bear. Later on he may become the possessor of an unruly pony which he fears to ride, and becomes known as Afraid-of-his-horse. Or, he may mount a horse from which another Indian has been thrown, and he then is spoken of as

Rides-the-horse. Further on he becomes a great hunter and kills five bears, and they call him Five-bears, and when he slays another his name changes to Six-bears. He may perform a valiant deed in battle and ride his horse through the camp of the enemy, for which he is dubbed Charges-through-the-camp. During the conflict he may kill one of the enemy. If his victim is the only one slain he is called Kills-the-enemy. But if others fall the one he has killed must be described, as Kills-the-one-with-the-big-knee. If he braids in his hair a yellow-feather which he has plucked from the tail of an eagle he may be called Eagle-tail. Eagle-feather, Yellow-tail or Yellow-feather. If he gives it to his friend he will be named Gives-feather, but if he refuses to part with it his name will change to Keeps-his-feather. Or he may obtain his name from some other object. If he is accustomed to ride what is commonly known as a "Calico" horse he may be called Spotted-horse, but if his horse has a short tail he will be known as Bob-tail-horse. The chances are that he will be known by all the foregoing names. His enemies will continue to speak of him as Long-ears, Runs-from-a-bear, or Afraid-of-his-horse, while his friends will call him Rides-the-horse, Six-bears, or Kills-the-enemy. For this reason it occurs that if you speak of the Indian in the presence of certain members of the tribe and call him Six-bears they will laugh at you and say: "That not his name; his name Runs-from-a-bear." But if you speak of him to certain others as Runs-from-a bear they will scowl and say: "That not his name; his name Kills-the-enemy.

Hence it will be seen that the Indian names are nothing, a delusion and a snare, and the practice of converting them into English appears eminently unwise. It is certain that the names on the rolls of the agency is the interpretation of only one of the Indian's several "names." A short Indian name in their own vernacular, or a syllable or two of a long one, if euphonious and pronounceable, as they usually are, will answer quite well for a family name, but the translations are never satisfactory, and cannot be too strongly condemned.—From "Naming the Indians," by *Frank Terry*, in March *Review of Reviews*.

HOW MONOPOLY RETARDS IMPROVEMENT.

THE tendency of monopoly to retard the introduction of industrial improvements is, in the opinion of the present writer, a more serious thing than its tendency to allow unfair rates. This aspect of the matter has hardly received proper attention. We have been so accustomed to think of competition as a regulator of prices that we have lost sight of its equally important function as a stimulus to efficiency. Wherever competition is absent, there is a disposition to rest content with old methods, not to say slack ones.

The French railroads may serve as a noticeable instance. The government of France was so impressed with the evils due to unnecessary duplication of companies in England, and with the gain that might result from a systematic arrangement of lines, that it gave a few great companies a monopoly of railroad construction and operation in their respective districts. The result has been that much-needed railroads have remained for years unbuilt, that salutary reductions in rates have been delayed, and that the evil effects of combination have been more conspicuous than the good ones. Similar instances of over-conservatism might easily be found nearer home, in those industries where a combination has enjoyed patent rights broad enough to protect it against home competition has been reinforced by an unduly high tariff against its foreign competitors. And it is in precisely these cases that the danger of political corruption becomes greatest.—*Prof. A. T. Hadley, in the March Atlantic.*

MEDIÆVAL USE OF STONE.

FOR a long period the most refined taste in elegant architecture was extensively practiced throughout this country upon scientific principles which, if ever equaled, have most assuredly never been surpassed, yet the quality of the stone employed seems rarely to have been considered further than for the facility with which it might be wrought by workman.

Relics of long-departed grandeur, either of the ecclesiastical or baronial order, abound in most parts of the kingdom. Nearly all these beautiful works of our ancestors are constructed with stone from the immediate neighborhood of such buildings, apparently without any regard to color, strata, or durability; and hence we frequently find stones of very different tints indiscriminately placed together in the same elevation, some extremely perfect, others in a very mouldering condition. Whitby Abbey is built of sandstone varying in color from white to a dark umber brown, carelessly mingled, and presenting a motley appearance. In all cases the brown stone is more decomposed than the white. Bristol Cathedral is built of red sandstone and yellow limestone, strangely intermingled. The sandstone appears to be invariably more decomposed than the limestone. King's College Chapel, at Cambridge, is built partly of white magnesian limestone from Huddlestone in Yorkshire, and a brown shelly oolite from Weldon in Northamptonshire, evidently without distinction or study to suit the architectural arrangement. The magnesian limestone is throughout much more dilapidated than the shelly oolite. It is easy to conceive the difficulties that would arise in obtaining a large quantity of so ponderous a substance as stone from the distance of only a few miles; and in situations remote from the sea, or from navigable rivers, at a period when few good roads were available, and canals were neither known nor thought of, the transporting a supply of stone for an extensive edifice would necessarily be attended with vast labor, and in many cases would appear to be an insurmountable difficulty.—*The Architect, London.*

FAILURE OF STATE OWNERSHIP.

ON the ground of industrial efficiency and public service, state ownership of industry has not, on the whole, shown itself equal to private ownership. On the question of relative rates there is perhaps room for a good deal of argument on both sides, but on the question of industrial progress there is no comparison between the two systems. All the great inventions of modern times—the steam engine, the steamship, the railroad, the telegraph, the telephone—have been developed and introduced by private enterprise. Where such inventions were concerned with the means of destroying life, governments have sometimes improved their efficiency; where they were concerned with preserving life and making it tolerable, governments have been content to follow private companies at a long distance. At a time when a majority of governments owned railroads, the air-brake, the interlocking system, and all the other methods incident to the safe handling of fast train service were developed by private enterprise, and were reluctantly introduced, years afterward, by government officials who found it much easier to avoid running modern trains than to acquaint themselves with the improvements which they involved. In short, government ownership seems to intensify those very evils which we have characterized as the most dangerous consequences of private monopoly. Nor would it appear that it lessens the political corruption with which such organized monopoly is attended. Where such corruption exists, state ownership substitutes one ring for two; making it easier to keep the evil secret, and correspondingly harder to do any real work in uprooting it.—*Prof. Arthur T. Hadley, in March Atlantic.*

MINERAL WOOL.

ACCORDING to Consul Merritt, of those who know mineral wool, or silicate of cotton as it is sometimes called, probably only a small number are familiar with the simple process by which it is made. The wool itself, serving a variety of useful purposes, as a non-conducting covering against heat and cold, alike for steam-pipes and cold storage-room walls, as a sound deadener in floors of buildings, and as a means of fireproofing, is, as its name implies, a soft and woolly substance, consisting of a mass of very fine mineral fibres interlacing one another in every direction, and thus forming an endless number of minute air-cells. The wool appears on the market in a variety of colors, principally white, but often yellow or gray, and occasionally quite dark, and is made by converting scoriæ and certain rocks, while in a

molten state, into a fibrous condition by a steam blast directed against the liquid material. Blast furnace slag forms the new material for one variety of the wool and sandstone for another, yielding respectively slag wool and rock wool, the latter being preferable for pipe covering because of the absence of sulphur, which with moisture present, becomes an active corroding agent. The furnace slag or the rock, as the case may be, is melted in a large cupola, and as it trickles out at the tap-hole in a somewhat sluggish stream it meets a high-pressure steam jet, which atomises the woollen material, if it may be so termed, blowing it in fleecy clouds into the storage-room provided for it.

Soft and downy, the stuff settles wherever a resting-place offers itself, the heavier wool coming down first, while the lighter portions are blown further along by the force of the steam, and settle in the more distant parts of the room. The material thus naturally grades itself into varieties of different qualities. A thousand pounds of wool per hour are turned out by one of the cupolas, and after the storage-room has been blown full the flocculent mass is pressed into bags, ready for the market.

The whole process, says the consul, affords an admirable and interesting illustration of the utilization of a formerly waste product.

GREAT COMBINATIONS HAVE RAISED WAGES.

IN what lines of industry are the wages lowest and the abuses greatest? Is it in those where modern methods have been most extensively employed, and where machinery with its attendant concentration of power has made the most progress, or is it in those whose methods are survivals from an earlier stage of industrial order?

To this question there can be but one answer. The lowest wages, the most unsanitary conditions, the grosses abuses and oppressions, are not to be found in factories, but in tenement-house industries. It is among the cigar-makers, or among the workers in certain branches of the ready-made clothing trade that these matters are at their worst. Yet it is just here that the conditions of employment are most like those which prevailed in earlier industrial periods.

The sufferers under the sweating system are not, as is so often charged, the victims of the present industrial order; they are the victims of a survival of past labor conditions into an age which has become familiar with better ones.—*Prof. Arthur T. Hadley, in the March Atlantic.*

GRANITE AND BRICK PAVEMENTS.

IN New York granite blocks and asphalt are the favorite paving materials. The commissioner of public works says granite blocks were adopted there in 1880. The blocks are three inches wide, ten to twelve inches long, and seven to ten inches deep, and are laid on cement concrete. These pavements he considers perfectly satisfactory. They have stood the heaviest traffic for twenty years without much deterioration, and combine the advantages of long service with comparative cheapness.

In a special report to the New York commissioner of public works, Stevenson Towle, consulting engineer, said: "Wooden pavements are a very expensive luxury. Brick pavements are now laid in many Western cities, and their use in this city is strongly urged by the advocates who argue that their long use in Holland is a sufficient guarantee of their durability. There is no doubt as to the long life of brick, and that brick pavements have the advantage of being less noisy than stone and more economical, but the use of brick has been limited to streets subject only to the light traffic of former times, and they are not strong enough to stand the heavy traffic of the present day."

CONTRACT NEWS.

Raleigh, N. C.—A bill has been introduced in the Legislature to advertise for and procure designs for a monument to be erected in Raleigh, in honor of the late Senator Zebulon B. Vance.

New Orleans, La.—The school children of this city are raising a fund of $6,000 to erect a monument to John McDonough, who bequeathed more than $1,000,000 to New Orleans for educational purposes.

Washington, D. C.—Congressman Cummings, from the Committee on Library, has reported favorably to the House the bill appropriating $100,000 to aid in the erection of a monument at Fort Greene, Brooklyn, N. Y., in memory of prison ship martyrs of the Revolutionary war.

Alexandria, Va:—A movement is on foot to raise funds for a monument to Prof. H. H. Harris.

Mansfield, O.—Sealed bids will be received at the office of the Ohio State Reformatory, this place, to March 3, for material and construction of stone wall around prison yard. For particulars address D. H. Gibson, Secy.

Steven's Point, Wis.—St. Peter's Polish Catholic congregation of this place will build a $12,000 church to replace the one destroyed by fire a few months ago.

Hartford City, Ind.—The Catholics here will erect a $10,000 church.

Lafayette, Ind.—Wing & Mahruin, Ft. Wayne, Ind., are drawing plans for a new church at Lafayette, to cost $15,000.

White Plains, N. Y.—The committee of supervisors of Westchester county contemplate the erection of a new county jail, at a cost of $100,000.

Pontiac, Ill.—A bill is before the Legislature asking for an appropriation of $193,000 for a new cell house and other improvements at the reformatory.

Mansfield, O.—The Mansfield Y. M. C. A. has secured the $30,000 needed for the erection of a new building for the Association. The present building will be torn down and the new one erected on the same site. Plans and specifications have been approved, and the work will begin as soon as the weather will permit.

Bristol, Fla.—The board of county commissioners has in contemplation the building of a modern jail for the county, and is advertising a notice that definite action will be taken at the next regular meeting.

Halletsville, Tex.—The commissioners of Lavaca county recommend the building of new county court house. The total bonded indebtedness of the county is $37,100, of which $30,100 is owed by the county school fund. There is $5,000 cash on hand.

Davenport, Wash.—The county commissioners of Lincoln county will, on the first day of March, 1897, at the office of the auditor of said county, town of Davenport, receive sealed proposals for furnishing of materials and labor for the construction of a court house for Lincoln county, Wash., to be erected at the town of Davenport. John K. Dow, 620 Rookery, Spokane, Wash., architect. J. H. Gunning, Sec.

Water Valley, Miss.—The Yalobaska county court will receive bids for the erection of a $20,000 court house.

Florence, Wis.—The Secretary of the Treasury transmitted to Congress a draft of a bill providing that the Secretary of the Treasury, after plans for a public building have been approved, may have them changed if deemed necessary. Buildings at Racine, Wis., Bloomington, Ill., and Mankoto, Minn., are mentioned as cases which would be acted upon under the proposed law.

The first authoritative statement relating to construction of new Mint at Philadelphia was made by Director Preston Feb. 10. He said that plans for the building were all ready, and that bids would soon be advertised for. The director favors letting the whole work to one contractor, and not awarding merely a contract for foundations at first. If one builder gets the whole operation, Mr. Preston believes that the building can be finished in two years from March, anticipating that the contract will be awarded then. The structure is to be of granite up to the second story, and of marble above that. A high wall, as ornamental as possible, will be erected back of the mint to shut out the buildings in the rear.

Albany, N. Y.—Press reports state that the following bills are before the legislature, asking for appropriations for state buildings; I. G. Perry, State Arch., Albany: Normal school, at New Paltz, $70,000; normal school at Potsdam, $50,000; normal school, at Holland Patent, $75,000; normal school, at Whitesboro, $75,000; normal school, at Oneida, $50,000; normal school, at Jamaica, $50,000; armory, at Buffalo, $375,000; armory, at Medina, $32,000; armory at Schenectady, $60,000; armory, at Whitehall, $42,000; 23d Regiment armory, at Brooklyn, $60,000; armory, at Auburn, $15,000; armory, at Troy, $85,000; armory at Flushing, $10,000; work on capitol, $100,000; work on capitol, $500,000; Rome custodial asylum, $310,133; insane prison at Dannemora, $125,000, and improvements at Sing Sing, $50,000.

U. S. Engineer Office, Nashville, Tenn.—Sealed proposals for supplying stone for building lock No. 5 on Cumberland River will be received here until 12 m., March 10, 1897, and then publicly opened. Information furnished on application. John Biddle, Capt. Engrs.

Albert Lea, Minn.—It is reported that Geo. L. Carrington proposes to erect a 4-story hotel, at a cost of about $50,000. Architects Kinney & Orth, Austin, Minn.

Montpelier, Vt.—It is stated that this city has been granted authority to issue bonds for the construction of a city hall to cost about $75,000. Geo. O. Stratton, Mayor.

Freeport, Ill.—Proposals will be received to March 1, to furnish material and labor required in the construction of building for the German Insurance Co. Address T. W. Tate, Architect Freeport, Ill.

Essex, Conn.—The wardens and vestrymen of St. John's church voted to accept plans for a new stone church to cost $20,000, to be built in the summer. Rev. Percy T. Fenn, rector.

Gadsden, Ind.—The M. E. Society propose to build a new church this season.

Marengo, Ills.—The members of the Methodist Church have appointed a building committee to solicit funds for the new church which they propose to build in the spring, to cost about $15,000.

Elmore, Minn.—Architect W. E. E. Greene, is preparing plans for a new church to be erect at Elmore.

Avoca, N. Y.—Plans have been prepared by Architect Otis Dockstater, of Elmira, N. Y., for the erection of a new church edifice for the Presbyterian church of Avoca.

Akron, O.—A movement is now on foot for the erection of a magnificent church building for the Woodland M. E. congregation. The Pastor, Rev. S. F. Wood, will give further particulars.

Bridgeport, Conn.—St. John's church; Essex, has voted to accept plans for a new stone church, to cost $20,000, to be built this summer.

Anaconda, Mont.—The First M. E. church of this city will rebuild their church June 1. The plans have been prepared by Messrs. Joseph Smith and H. N. Black. The work contemplated will cost about $10,000.

Hope, Ark.—The Presbyterian church and parsonage burned a few days ago. This church and parsonage were very well covered by insurance and will be rebuilt at an early date.

East Liverpool, (O.) Christian church, recently destroyed by fire, will erect a new structure at a cost of $15,000.

Grand Rapids, Mich.—St. Ignatius' church at Houghton, will build a new building. To be a very handsome church edifice.

Atlanta, Ga.—The Jackson Hill congregation is preparing to build a very handsome new Baptist church. Rev. A. A. Marshall, pastor of the church, will give particulars. It is estimated that the building will cost $50,000.

Marshalltown, Iowa.—Plans have been prepared by Architect J. H. Prescott for the erec-

tion of a new church in this city. To be constructed of stone and brick. Cost about $30,000.

Harrisburg, Pa.—Plans have been prepared by Architects Miller & Kast, for the erection of the handsome new St. Paul's Methodist church. Marble tiling.

McDonough, Ga.—Address Golucke & Stewart, Atlanta, Ga., regarding new court house for this place.

Muscatine, Iowa.—Plans and specifications have been prepared for the enlargement of the court house.

Davenport, Wash.—Architect John K. Dow, Spokane, Wash., has plans in course of preparation for new court house.

West Point, N. Y.—Sealed proposals in triplicate for a public latrine received by J. B. Bellinger, Capt. U. S. A., this place.

Greensburg, Pa.—The county commisioners have recently been directed to erect a new court house. To be constructed of brick and stone. The mayor of Greensburg will answer all questions relative to the erection of the new building.

Fairmont, W. Va.—Plans are now being prepared by Architects Yost & Packard, Y. M. C. A. Building, Columbus, O., for the erection of the new court house for Marion county, at Fairmont. Address Chas. E. Manley, of Fairmont.

St. Albans, Vt.—Sealed proposals will be received by William Martin Aiken, Supervising Architect, Washington, D. C., until March 3, 1897, for the rebuilding and completion of the United States custom house and postoffice here.

Jefferson City, Mo.—Mr. Pope, of Jefferson City, introduced three bills in the house Feb. 3, calling for an appropriation of $305,000 for the improvement of the state capitol building. $90,000 goes to make the building fire-proof and for other repairs.

Seattle, Wash.—The plans of A. F. Heide for the new court house at this city, have been accepted, which when carried out will give the county one of the finest court houses in the State.

Helena, Mont.—It is reported that bonds of this city to the amount of $1,000,000 for the erection of a new capitol are under consideration. Supervising Architect Aiken, Treasury Department, Washington, D. C., will give particulars.

Davenport, Iowa.—A meeting of the county commissioners will be held Feb. 15 to pass finally upon the plans and specification of Architect John K. Dow, of Spokane, for the new court house and to select the site for same.

The architectural plans for the new court house at Eureka, Ill., have been selected and approved.

Harvey, Ill.—J. C. DeKlerk, city engineer, will give particulars relative to the erection of a suitable new city hall at Harvey. Plans for same are now being prepared. The new city hall will be a very handsome structure.

Bangor, Me.—Plans have been prepared by Architect George W. Adams, of Lawrence, Mass., for the Waterville (Me.) city building. To be constructed of red pressed brick, with buff brick and Indiana limestone trimmings. Building must be completed, ready for occupancy by January 1, 1898.

McMinnville, Tenn.—Sealed bids will be received for the construction of a new court house for Warren county at McMinnville. Plans and specifications of A. R. Hammer.

Mansfield, O.—Proposals will be received to March 3, 1897, for material and labor to be used in constructing stone wall around prison yard. Bids will be received for both lime and sandstone. Plans and specifications of Levi T. Scofield, 338 Erie street, Cleveland, O.

Michigan City, Ind.—An appropriation of $175,000 has been asked for by Warden Harley for extensive repairs to the Northern Prison in Michigan City.

Madison, Wis.—An appropriation of $125,000 will be asked for by the State Board of Control for the purchasing of a site and the erection of the necessary buildings for a detention house or prison for first offenders.

Milwaukee, Wis.—The committee have agreed to issue $150,000 worth of bonds to build the Grand avenue viaduct, in Milwaukee, which is to be built of stone, iron and steel.

Turner's Falls, Mass.—Plans have been prepared by Architects A. B. Tower & Co., of Holyoke, this state, for the erection of a very handsome hotel at Turner's Falls. J. C. Collins

will g ve part.cu.ars. The hotel will be constructed of brick with granite trimmings.

Frankfort, Ky.—The county jail was wrecked by an explosion.

Davenport, Iowa.—The question of building a new jail for Scott county, to cost not more than $50,000, will be submitted to popular decision Feb. 20, at special election.

Washington Court House (Ohio) Masons are preparing to erect a temple to cost $50,000.

Kansas City, Mo.—Plans have been drawn for a seven-story, fireproof building to cost about $300,000, for the Board of Trade. Col. I. H. Phelps, a prominent member of the Exchange, will give particulars.

Washington, D. C.—Plans have been prepared by Architect N. T. Haller, of 1216 S street, N. W., for the erection of a building. To be constructed with Indiana limestone trimmings, marble tiling, etc. Cost about $150,000.

A new $100,000 theater is projected at Sedalia, Mo.

Ottawa, Canada.—Sealed bids were received for the erection of a new schoo house at Herivale. To be constructed of stone. Plans and specifications were prepared by Architect M. C. Edey, Sparks street, Ottawa. It will be a very fine school structure.

Cincinnati, O.—Plans have been prepared by Architect A. R. James, Fifth and Walnut streets, for the erection of an engine house for he city. To be constructed of pressed brick and stone. Cost about $18,000.

Marinette, Wis.—The new stone hotel, to be built by the Spaulding Lumber Company, at Cedar River will be two stories high, with a basement. Will have all the modern conveniences and cost about $10,000.

Washington, D. C.—The house committee on military affairs agreed unanimously to report for passage Congressman Cannon's bill for the location of a branch of the National Soldiers' Home in Vermillion county, Illinois, at a cost of $300,000, of which amount $200,000 is to be appropriated for immediate expenditure.

Fort Dodge, Iowa.—Sealed proposals will be received until March 1, 1897, by Father Lenihan, for the erecting of the Sisters' Academy. Plans and specifications were prepared by Architects Wherry & King.

Washington, D. C.—The House Committee on Library, has favorably reported a bill for the erection of a statue to Peter Charles L'Enfant, in the city of Washington.

Jefferson City, Mo.—Representative Bittinger introduced in the house a bill providing for an appropriation for a monument, to be erected over the grave of Gen. John S. Marmaduke in the state cemetery here.

Circulars are being sent out by Philadelphia railroad employes to secure popular subscription for a monument to the late President Geo. B. Roberts. It is intended that it shall be the finest in the country.

Davenport, Iowa.—Resolutions will be submitted at the special election to be held Feb. 20, giving the supervisors the power to build a jail for Scott county, to cost not over $50,000. H. F. Jarchow, clerk of the board, will give particulars.

Hanford, Cal.—Plans have been prepared by Architects McDougall Brothers, of San Francisco and Bakersfield, for the erection of the new county jail and sheriff's offices. The new buildings will be constructed of granite, concrete and steel, and cost about $15,000.

Sidney, Iowa.—Sealed proposals will be received up to Feb. 18, 1897, by the undersigned, for the erection and completion of a jailer's residence and jail combined, in Sidney. Bell & Kent, Architects, Council Bluffs, Iowa.

Butler, Pa.—A new county jail, to cost about $50,000, is soon to be erected by the commissioners of Butler county.

Indianapolis, Ind.—The new city building for police will be erected. The contemplated cost of the building is placed at $70,000.

Grand Rapids, Mich.—The Seventh Day Adventists will build a new church at Hendon. They will erect a very handsome church edifice.

Logansport, Ind.—The congregation of the Broadway M. E. Church, contemplate the erection of a very handsome new church in this city. The pastor will give further particulars.

Rhinebeck, N. Y.—Plans have been prepared by Architect Francis L. Hoppin, for new Church of the Messiah, at Rhinebeck. The Rector E. H. Saunders, will give particulars.

Washington, D. C.—The Secretary of War, has granted permission for the erection of a Roman Catholic cathedral building, on the

government grounds at West Point. Three other religious bodies have applied for information as to whether they will also be allowed to place church buildings on the West Point grounds.

Torrington, Conn.—Plans have been prepared by Architect Henry M. Congdon, for the erection of a new church for the Trinity congregation at Torrington. The Rector, Rev. J. C. Linsley, will give particulars.

Howard, Pa.—Plans have been prepared by Architect B. K. Dean, for the erection of a new church at Howard, for the Disciple congregation.

North Baltimore, Ohio.—Rev. Cooper, pastor, will give particulars relative to the erection of a very handsome new church for the Disciple Church congregation at North Baltimore.

Westport, Mo.—Plans have been prepared by Architect X. F. E, Hill, for the erection of the new city hall at Westport. H. B. Abercrombie, of Westport, will give further particulars.

Harrisburg, Pa.—The Pennsylvania State Capitol was destroyed by fire Feb. 3, and a new structure will be erected at a cost of $1,500.000.

Charleston, S. C.—The Mayor, of Charleston, will give particulars relative to the erection of a new city hall. A committe will receive bids.

Paxton, Ills.—The county clerk will give particulars relative to the new court house to be erected at Paxton. To cost $15,000.

Davenport, Wash.—The county commissioners have accepted the plans of Architect J. K. Dow, of Spokane, for the new county court house and jail. Will be built of brick and stone, and cost $15,000. The commissioners will advertise for bids in a few days.

Portland, Maine.—Plans for Waterville's new city hall have been completed. The specifications call for the building to be built of red pressed brick, and Indiana limestone trimmings The corridors will have marble floors.

Atlanta, Ga.—Venable Brothers, have been awarded the contract, at $17,200, for the erection of the Chickamauga granite monument.

Washington, D. C.—Congressman Hurley, of Brooklyn, introduced bill to appropriate $50,000 to erect in Washington, a bronze statute to Gen. Henry W. Slocum.

Albany, N. Y.—Mr. Armstrong, presented a bill in the New York legislature appropriating $5,000, to assist in the erection of a monument to Frederick Douglas in Rochester.

The International Machinists are raising a fund to erect a monument over the grave of T. W. Talbot, the founder of the International association. Talbot's grave is in Florence, S. C.

Buffalo, N. Y.—The Buffalo Realty and Co-operative Co., will build an apartment building 70x178 in this city. Quantities of stone, marble, granite and slate will be used. Address, John H. Coxhead Architect.

Syracuse, N. Y.—Plans have been prepared by Architects Oscar Cobb & Son, Manhattan building, Chicago, Ill., for the erection of a very large and handsome opera house for Mrs. J. H. Vieling, of Syracuse. To be entirely fireproof.

Des Moines, Iowa.—The board of supervisors have prepared the plans and specifications for the erection of the new county insane asylum, to cost $55,000.

Princeton, Ind.—Princeton Lodge, A. O. U. W., contemplate building a $20,000 opera house this year.

Mt. Pleasant, Iowa.—Congressman Avery states that plans for the new buildings for the government industrial farm here are nearly completed.

Chicago, Ill.—A hotel structure is shortly to be erected in St. Louis, after plans by L. B. Wheeler and Craig McClure. It will be a very handsome building and will cost about $350.000.

Muskegon, Mich.—Funds are being raised in New York, to build a new main hall for Kalamazoo College. The president of the college will give particulars.

Milwaukee, Wis.—The building committee of the Milwaukee-Downer College, has decided to request all architects interested in making sketch plans to hand them in to Secretary H. L. Chapman, not later than Feb. 15. The new college will be a very fine structure.

Wausau, Wis.—Commissioner Lamoreaux, of the General Land Office, will give particulars relative to the new government building which is to be constructed in this place, at a cost of about $50,000. Congressman Stewart can also give information.

Sheboygan, Wis.—Plans are being prepared for the erection of a very fine church edifice in this city.

Middleboro, Mass.—The Church of Our Savior, this city, will erect a new edifice from plans just prepared by Crane, Wentworth & Goodhue, of Boston. Structure will cost $35,000. Address the pastor, Rev. William Bayard Hale, of Middleboro.

St. Louis, Mo.—The West Presbyterian Church will build an addition, at a cost of about $15,000, from plans by J. G. Cairns of the Turner Bldg. Addition to be constructed of stone.

Whitinsville, Mass.—St. Patrick's congregation will erect a new church edifice. Plans by Architect C. D. Maginnis, Boston. Address Rev. Peter S. O'Reilly for particulars.

Pursuant to decision of the county commissioners in special session, Architects Wing & Mahurim, of Ft. Wayne, Ind., have heen employed to furnish plans for a new court house at Knox, Ind., to cost about $70,000.

Clinton, Iowa.—It is reported that the C. & N. W. R. R. will erect a new depot at Clinton in the spring. Beyond the probability of its location being on Fifth street, no other particulars are yet given.

Battle Creek, Mich.—The Grand Trunk Railway talks of erecting a Y. M. C. A. building here for the benefit of railroad men.

Kalamazoo, Mich.—Plans will be received up to March 10 by Board of Education, for a brick and stone high school building. Cost, exclusive of heating, plumbing and finishing, not to exceed $20,000. Address H. E. Hoyt, Sec'y.

Lockport, N. Y.—Ald. Foley introduced a resolution asking for the introduction of a bill at Albany to provide for the construction of a new police station to cost $12,500. The resolution was carried.

Albany, N. Y.—Henry Ives Cobb is making plans for a new bank building to be erected at Albany, to cost $300,000.

Ft. Wayne, Ind.—New bids may be advertised for on the contract for the building of Allen county's new court house. The bid of W. P. Junglause, of Indianapolis, was the lowest, but it exceeded the anticipations of the commissioners by at least $100,000. His estimate was $573,672.41 on the court house proper and did not include plumbing, electrical construction or power station.

New York City.—The House committe one Public buildings at Washington, D. C., decided to report favorably a bill, with Senate amendments, providing for the erection of a new custom house building on the present site in New York City. Total cost will be $5,000,000.

Davenport, Iowa.—The special election in Scott county, in the matter of a new jail, resulted in a victory for the project. The structure, as planned, will cost $50,000—the money to be taken from the surplus proceeds of the mulct tax.

Youngstown, O.—The county commissioners will receive bids up to March 19, for proposals on substructure and stone for a new bridge over the Mahoning river, at a point known as Spring Common.

Jackson, Mich.—The Hibbard Opera Hous burned to the ground Feb. 27. Loss, $35,000. Building, which will be rebuilt soon, was owned by W. B. Webb and N. S. Potter.

Jackson, Miss.—Governor McLaurin will give particulars relative to new Capitol building, to replace present worn out structure, which will be erected at a cost of about $750,000 or $1,000,000.

Washington, D. C.—The House committee on public buildings Feb. 26 authorized favorable reports as follows: Carlinsville, Ill., $50,000, and Carrollton, Ky., $25,000.

Indianapolis, Ind.—Board of Public Works has adopted specifications for a new city building, to be erected on the site of the recent police station. It is to be three stories in height and fireproof. Total cost not over $125,000.

Albany, N. Y.—Twenty-five representative business men at the Delavan lately decreed the erection of a new hotel, at a cost of about $325,000, according to accepted plans. Wm. Van Gaasbeck will give particulars.

Syracuse, N. Y.—Work on the House of the Good Shepherd will commence as soon as weather will permit. Address Bishop F. D. Huntington.

Rochester N. Y.—A special dispatch from Albany states that Assemblyman Armstrong's

bill appropriating $20,000 for the construction of a new bridge over the canal at North Fitzhugh street, in this city, passed the senate Feb. 23. Alderman Ford of the third ward will give particulars.

Albany, N. Y.—The ambition of the governors of the Albany Hospital to build a new hospital that will be a credit to Albany and on a par with the best institutions in the state is likely soon to be realized. The new hospital, it is estimated, will cost from $150,000 to $300,000. Plans have been prepared by Fuller & Wheeler, Albany architects.

Lansing, Mich.—An appropriation of between $35,000 and $50,000 will be asked of the legislature for a new library building, an appropriation of about $30,000 for a lighting plant, and an appropriation will be asked for an annex to the hospital.

Brunswick, Ga.—Plans will be received up to April 1, 1897, for a new court house, to cost from $30,000 to $45,000. As soon as plans are accepted, bids will be advertised for. Address J. G. Lehman, clerk county commissioners of Glynn county.

Baltimore, Md.—At meeting of council, the ordinance appropriating $50,000 for erection of a school building on Eastern avenue passed.

Gatesville, Tex.—The commissioners' court made an order to build a new court-house and jail.

Chicago, Ill.—A three-story and basement apartment at 636 and 638 Evanston avenue, to be built of stone, at cost of $18,000. Architect J. A. Miller, 95 Washington street. Owner Thomas F. McGivern, 199 N. Clark street.

Also; a four-story and basement store and flat at 500 Milwaukee Avenue, for Morris Drosdowitz. To be built of stone. Architect Claus Thisslew, 400 Milwaukee avenue.

Detroit, Mich.—Plans by Architect Jas. G. Kastler, 1015 Chamber of Commerce Building, are complete for terrace of seven brick and stone residences. Cost $35,000.

Brooklyn, N. Y.—From plans by Architect M. Thomas, 16 Court street, an eight-story apartment-house will be built on the corner of Clinton and Greene avenues, for Kluber & Ryan, 8th avenue and Horatio street, New York city. Material light brick, limestone and terra-cotta. Cost $150,000.

New York, N. Y.—Architects Buchman & Deisler, 11 East 59th street, have planned an eight-story store and flat building for P. Norton 1035 Third avenue. Building to occupy corner at Sixth avenue and 58th street. Cost $60,000.

Also, by Architect W. C. Dickerson, two five-story flats on the corner of Elton and 15th street, for George Tremberger, 1035 Forest ave. Cost $45,000.

Also, by Architect Edward Wenz, of 1491 Third avenue, two five-story store flats at Seventh avenue near 132nd street, for Geo. W. Eggers of 114 West 119th street. Cost $58,000. All above to be built of brick and stone.

Griffin, Ga.—Proposals will be received by the commissioners of roads and revenues of Spalding county, at the office of T. R. Mills, in Griffin, Ga., until noon of April 15, 1897, for the erection (except basement walls, which will be finished to level of first floor beams by the county) and completion of a fireproof jail building, and jail cells, in accordance with plans and specifications now on file in said office.

Huntsville, Ala.—Plans, specifications and bids for a new county jail for Madison county, Alabama, are invited to be presented to the Probate Judge at Huntsville, Ala., by 12 m., on March 15, 1897. Plans should be prepared for a jail to cost from $20,000 to $25,000, and to accommocate about one hundred prisoners. A certified check for $1,000 must accompany the bid, as an evidence that the contractor will furnish a $10,000 bond.

Jefferson City, Mo.—The Senate has passed a bill appropriating $1,800 for the purpose of erecting a monument at the grave of Daniel Boone and wife, who are buried in Warren county.

Sioux City, Iowa.—The Floyd Memorial Association held a meeting recently and appointed a commlttee to arrange for the erection of a suitable monument over the grave of Sergeant Charles Floyd.

The citizens of Oshkosh, Wis,, have decided to erect a monument to Chief Oshkosh, in North Side Park. Oshkosh was the last of the Menominee sachems and played a prominent part in the pioneer history of the Northwest. The settlement at the mouth of the upper Fox river, platted in 1836, had been called Sauker Point and Stanley's Tavern, but in 1840 the settlers named it Oshkosh in honor of the chief.

CHANGE OF NAME.

Messrs. Dobbie, Stuart & Co., Niagara Falls, N. Y., announce that their business has been purchased by the Dobbie Foundry and Machine Company, Incorporated, who will continue it as heretofore in all its branches. The officers of the corporation are: John Dobbie, president and treasurer; A. J. Porter, vice president; A. J. Dobbie, secretary. Mr. John T. Horton, Mem. A. S. M. E., will remain with the company as mechanical engineer and superintendent. The capacity of the former plant will be increased in the erection of new buildings and the addition of new machinery, including a ten-ton foundry furnace and an 800-pound steam hammer. The reputation of the old firm will be fully maintained by its successor.

ENJOINED.

JUDGE ACHESON, of the United States Court for the Western District of Pennsylvania, at Pittsburg, recently granted to the Knox Rock Blasting Company preliminary injunctions against the following persons for infringement of the Knox patents: Wilson Brothers, of Ellwood City, Pa.; Patton & Gibson, of Pittsburg, Pa.; Hugh McGowan & Sons, of Wampum, Pa.; John Cleary, Hoytdale, Pa.

CHANGE OF FIRM NAME.

The corporation heretofore doing business in New Jersey, New York and elsewhere under and by the name of "W. A. Crook & Bro's Co." has recently, pursuant to the laws of the state of New Jersey, under which such corporation was and is organized, changed its corporate name from that of "W. A. Crook & Bro's Co." to that of "LAMBERT HOISTING ENGINE Co.," under which latter name it will continue to do business in the same line as heretofore. Lambert Hoisting Engine Co. will receive all the assets and pay all the liabilities of the W. A. Crook & Bro's Co.

TO SELL. TO BUY. TO EXCHANGE.

Advertisements inserted in this department for 15 *cents per line each insertion.*

FOR SALE.—One Ingersoll-Sergant Bar Channeler, with bits, in good order, cheap. One new C Aultman Co. No. 4 Stone Crusher, with elevators. One new C Aultman Co. 30 H. P. Engine, complete, cheap. Address, THE PLYMOUTH STONE Co., Plymouth, O.

FOR SALE—Cheap, a four gang marble mill and quarries, located at Loudon, Tenn. This mill must be sold or leased within the next few months, and the best offer gets the mill. Will sell or lease mill separate from quarries if so desired. Address H. N. GREER, Loudon, Tenn.

WANTED—A counter sinker or dishing machine for basin slabs. Cheap for cash. State maker and price. MAXWELL & DEMPSEY, Jefferson and Cherry streets, New York City.

FOR SALE—One second-hand Ingersoll channeling machine in first-class order, for sale cheap. Apply to LORD, BOWLER & CO., Cleveland, Ohio.

FOR SALE—Quarries, etc., of the Chicago Brownstone Co. Supply inexhaustible. Membership in Quarrymen's Association with same and corporate franchise if desired—or will lease on royalty. CHICAGO BROWN STONE Co., 716 Reaper Bl'k, Chicago.

HELP WANTED.

Advertisements under this heading 10 *cents per line each insertion.*

WANTED—Large quarry company of New England wants practical working foreman, capable of stripping, clearing, opening and working marble quarries. Also expert channelers, gadders and drillers. State fully experience, references and pay wanted. Address F. J. ELLSWORTH, Case Building, Cleveland, O.

WANTED—A draughtsman who thoroughly understands all branches of stone-cutting, making patterns, estimating stone quantities from drawings. A practical man who has been in the business preferred. Address F. C., 726 Scranton St., Scranton, Pa.

SITUATIONS WANTED.

Advertisements under this heading inserted for subscribers to STONE *free of charge. Advertiser must send* 25 *cents to pay postage, if replies are to be addressed in care of* STONE. *Rate to non-subscribers,* 10 *cents per line each insertion.*

WANTED—Any quarry corporation in need of a thoroughly experienced manager or foreman would find it to their advantage to write to 20 PEARL street, Montpelier, Vt.

WANTED—Advertiser desires position with quarry owner or manufacturer, building or monumental work. Accustomed to management and experienced in plans, estimates, drawing, etc. Address, A. B., care of STONE.

WANTED—Position as manager and salesman, in good city, with a reliable firm, by a thorough granite and marble man, practical and experienced in all branches of the business. Best of references given. Moderate salary accepted for first year. R. H. C., care STONE.

TO QUARRYMEN—I would like a position as manager for some large quarrying firm. Have had twenty years' practical experience in the stone business. Would buy an interest in the business if satisfactory terms could be made. O. HURST, Fort Hunter, N. Y.

A CHANCE TO SAVE MONEY!

"Shaw's Booklet" of second-hand Machinery for Contractors, Mines and Quarries, is now ready. Mailed free. Write for a copy. See what I have. Get my prices

WILLIS SHAW,
506 New York Life Bldg., Chicago, Ill.

Edwards, Macdougal & Co., 180 W. Regent St., GLASGOW, SCOTLAND.

STONE MERCHANTS,

Rouge Granite, Seynite, Marble and Sandstone for Building and Monumental purposes. Paving stones. Curbs and Setts for Roadways.

Correspondence Invited.

Wm. Wolstencroft's Sons & Co.

(Frankford)

PHILADELPHIA, PA.

Manufacturers of

PNEUMATIC TOOLS

For Stone-Cutting and Carving on All Kinds of Stone.

We beg to submit the following letter which explains itself:

GEORGE HARDING,
GEORGE J. HARDING,
Counselors at Law.

FRANK S. BUSSER,
Notary Public.

LAW OFFICES OF

Harding & Harding

901 WALNUT ST.

Philadelphia, Nov. 23, 1895.

MESSRS. WM. WOLSTENCROFT'S SONS & CO.,
Frankford, Philadelphia.

Dear Sirs:--We have carefully examined your Pneumatic Tool devices, Patents Nos. 364,081 and 373,746, mentioned in the letters and advertisement of the American Pneumatic Tool Co., of New York, and the opinion of Judge Wheeler in the suit of said company against Robert C. Fisher & Co., mentioned in said letters and advertisement. We have no hesitancy in saying that nothing in said opinion or patents in any way affects your tool, and that no claim having the slightest validity upon either of said patents can be brought against you or those using your tools,

YOUR TOOL IN NO WAY INFRINGES EITHER OF SAID PATENTS and is in no way affected by said patents.

Very Truly,

HARDING & HARDING,

Per George Harding.

BOOKS AND PERIODICALS.

A valuable book of 164 pages has been issued by the Trenton Iron Co., Trenton, N. J. The book is entitled "Wire Rope Transportation in all its Branches." It treats of wire-rope tramways, hoist conveyors, mine haulage plants, and power transmission. The book is handsomely printed, substantially bound, and is illustrated with many views of the Bleichert wire-rope tramway system, shows hoist conveyors adapted to various uses, gives details and illustrations of the application of wire-rope to shafts, inclined planes and mine haulage etc. The book will be found valuable for reference and prove a useful addition to any mechanical library. Copies free.

The March *Chautauquan* is announced as a Homer number, and has for its special features exhaustive and attractive articles on varlous phases of Homeric art and literature. The masterly paper on "Homeric Art" by Prof. Alfred Emerson is accompanied by twelve illustrations of Greek art; the stories of the Iliad and Odyssey are skilfully told by Prof. William Hyde Appleton and Prof. Abby Leach; Prof. Angie Clara Chapin treats in a pleasing manner of "The Women of Homer, while "The Homeric Age" is ably pictured by Prof. Martin L. D'Ooge.

A catalogue entirely devoted to illustrations and detailed description of air compressors has recently been issued by the Ingersoll-Sergeant Drill Co., of New York City. While not ,in a strictly literary sense, a text book on air compression, and the manifold applications of that power to the needs of commerce and mechanics, it will serve as such in studying the machines herein described, and the duties they are guaranteed to perform. The application of compressed air to services heretotore solely performed by steam, water and electricity adds efficiency while decreasing operating costs a matter of sufficient importance to interest every power user, without any further argument. A copy of this catalogue, which is No. 81, will be mailed on application. See ad. in this issue for company's number addresses.

The American Hoist & Derrick Company's forty-four page catalogue, entitled "Contractors' and Quarrymen's Sketch Book," is a creditable specimen of trade literature from the bookmaker's viewpoint. Its copyrighted contents consist of photographic views showing the use of their engines and derricks in quarrying, bridge construction and building operations all over the country. These illustrations are by the half tone process, printed in alternating pages of soft green and bronze tints, grateful to the eye and pleasing to the artistic sense. The advertising instinct of the management crops out strongly in their use of slip sheet testimonials, autograph letters in minature from prominent construction companies, which are loosely inserted in the catalogue. Copies free by addressing any of the company's officers. See their ad. in this issue.

We Need The Following

Issues of STONE to complete our files:

DECEMBER	1892
FEBRUARY	1893
MARCH	1893
APRIL	1893
MAY	1893
AUGUST	1893
SEPTEMBER	1893
OCTOBER	1893
NOVEMBER	1893
JANUARY	1894
MAY	1894
JULY	1894
JANUARY	1895
MAY	1895

We will extend the subscription term of any of our subscribers copy for copy. That is, for each one of these issues we will tack on one issue to the subscriber's term. If you don't bind the magazine, look over your numbers on hand and send to us any of them here listed, and we will be greatly obliged to you.

VICTORY FOR THE BOYER HAMMER.

To the Trade:

We are pleased to state that on January 7th the United States Circuit Court of Appeals, at New York, in the infringement suit brought by The American Pneumatic Tool Company against the Bigelow Company, of New Haven, Conn., for using the Boyer Hammer, decided in favor of the defendant, and reversed the decision of the lower court, thus confirming the position we have always taken, and the assurances which we have given the trade, that the Boyer Hammer did not infringe the patents of the American company, and furnishing a complete answer to the threats and misrepresentations which that company have been making with respect to the Boyer Hammers.

In addition to our regular Boyer Hammers, which are familiar to the trade and have acquired such a high reputation, we are now prepared to furnish a still further

improved style of hammer, which we have designated The New Boyer. The valve mechanism of this new hammer is entirely different from the old, and is designed to accommodate an increased length of piston chamber and an increased length of piston stroke, and consequently materially increase the force of the blows of the piston in a tool of given size, without increasing the length of the tool as a whole. It also reduces the vibration of the hammer to practically nothing, so that in both of the above respects the new hammer is superior to the old. We are prepared to furnish either style. ALL TOOLS SENT ON TEN DAYS' TRIAL, SUBJECT TO APPROVAL, AND GUARANTEED FOR ONE YEAR AGAINST REPAIRS. Our new catalogue is in the hands of the printer, and is now ready for distribution. We desire to have all stone-workers possess a copy of it. Furnished free on request.

CHICAGO PNEUMATIC TOOL CO.,

635 Monadnock Building, Chicago, Ill.

NOTES FROM QUARRY AND SHOP.

A branch of the Monson Granite Company is to be started in Palmer, Mass.

Rowlesburg, W. Va.—W. W. Shoch has purchased the Preston county bluestone quarries and will greatly enlarge the plant by putting in new machinery.

Berlin, Wis.—The plant of the Berlin and Montello Granite Company, in this city, was attached 1st inst. by seven different parties from Montello and this city for about $1,200.

East Longmeadow, Mass.—Durantaye & Rankin have commenced preparation for work at the Granger quarry, formerly operated by William Mitchell, of Springfield.

Knoxville, Tenn.—A new quarry of Knox county marble has been opened and will be steadily developed in the future in the Eleventh district of this county. The quarry is the property of the Tennessee Producers' Company. The Bond and Great Bend deposits have been selected as the most suitable for present operation and the best of vaiegated marble is being taken from there. At present but a dozen men are engaged in the preliminary work, but the force will be largely increased at once.

Easton, Pa.—Suit has been entered in the Court of Common Pleas by T. F. Emmens, of Easton, and Samuel Keat, of Pen Argyl, against representatives of the Hower, the Danielsville, the Phœnix and the Gem slate quarry companies, in this county, for $75,000. The plaintiffs claim that they were sent to England to negotiate the sale of the quarries in question, with the agreement that they were to have as commission all they secured over a certain sum; furthermore, that they agreed, according to contract, to sell the properties for $500,000, with the guarantee that the purchaser would receive dividends of six per cent. on the sum invested, but that the defendants refused to make such guarantee, thereby losing the opportunity to sell.

Harrisburg, Pa.—Dauphin county will be heard from when the state is ready to go ahead with the erection of its new Capitol building. On the farm of Cyrus Gingrich, near Hockerville, there is a quarry which turns out a fine quality of marble. J. H. Black, of Annville, is in charge of the quarry, which is forty-five feet broad and twenty-five feet high. To show that the quarry is rich in promise it need only be said that the supply reaches 200 feet back of the opening.

Milford, Utah.—Seven miles east from this town there is what should be developed into one of the richest pumice quarries in the United States. The deposit lies on the north end of a granite mountain of considerable extent and is easy of access. It is down hill from there to the railroad, and enormous loads may be hauled by team. The deposit underlies decomposed granite and is itself underlaid by a formation some feet in depth of a chalky substance which has proven to be, in its natural state, a very good polish for the rougher wares, and by putting it through a grinding and bolting process, manufactures a polish unexcelled by even the celebrated Tripoli itself. The pumice is of a very white color and ranges from a fine flour to a coarse grade, thus furnishing all the requirements for a complete commercial product, the only two or three other good mines of pumice in the United States either being too coarse or too fine within themselves to be a success. An expert in this line has visited this place with an idea in view of purchasing it for the purpose of mixing some of the finest grade products from elsewhere, which is coarser, but no satisfactory agreement could be reached. Stone like this has a market value of something like $50 per ton in its rough state, and when a freight rate of $9 or $10 will place it on the market it looks as though some one ought to be interested in this article. The property is owned by Milford men, who, of course, will let go when they get enough. The polishing material is abundant and easy of manufacture.

The Michigan Stone and Supply Co., of Detroit, have closed contracts for over 100,000 feet of curbing to be shipped from their Woolsmith quarries, in Monroe county, Mich., during the ensuing year.

On the tombstone of a good sister in a Kansas cemetery is inscribed: "She got up ninety-seven church socials and served the Master on thirty-seven committees." Verily, death chooses a shining mark.

Pottstown, Pa.—The stone-cutters at the Falls of French quarries had a narrow escape from instant death a few days ago. They were working nearly one hundred feet below the surface when small stones rolling down warned them that the huge rocks were giving way. In-

Air Compressors

and

Pneumatic Tools in the Stone-Worker's Shop Produce This Result

VIEW OF INGERSOLL-SERGEANT COMPRESSOR RUNNING CARVING TOOLS.

USED IN QUARRIES BY

Allegheny Quarries, LANCASTER, OHIO
Michigan Stone & Supply Co., SCOFIELD, MICH.
Booth & Flinn, BLAIRSVILLE, PA.
Casparis Stone Co., etc., KENNETH, IND.

STONE WORKERS

L. L. Manning & Son, PLAINFIELD, N. J.
Bowker, Torrey & Co., BOSTON, MASS.
J. S. Rowe, BEDFORD, IND.
Many Others.

COMPLETE PLANTS FURNISHED.

The INGERSOLL-SERGEANT DRILL CO.

OLD COLONY BUILDING,
CHICAGO.

HAVEMEYER BUILDING,
NEW YORK.

201 CONGRESS STREET,
BOSTON, MASS.

26 SOUTH WATER STREET,
CLEVELAND, O.

ROCK DRILLS. CHANNELERS FOR QUARRYING.

Please mention STONE when you write to advertisers.

stantly a boulder of at least fifteen tons, came thundering down. The men barely had time to get out of its path. Harry Keim was struck, however, and badly injured, and Thomas Brewer lost a portion of his thumb.

Sacramento, Cal.—Assemblyman Hill's bill to permit municipalities to purchase and operate stone quarries was amended by the Assembly committee on municipal corporations, and favorably reported.

Considerable interest has been aroused at Great Barrington, Mass., and in Sheffield, by the announcement that the Goodale marble quarries on the Sheffield-Egremont road were again to be operated. The information was given by an interested party who said that the company formed to resume marble quarrying there was composed mainly of Cleveland, O., capitalists and that the new organization was furnished with $60,000 to back their enterprise. About two months ago several specimens of the stone were shipped to Cleveland for examination and testing, the result being so satisfactory that the formation of a stock company to place the marble on the market was effected. The agent of the company, James Carpenter, of New York, then visited the quarries, and since then has been arranging to open the works as soon as the weather moderates sufficiently to proceed understandingly. It is claimed that work will be furnished to between 100 and 200 men, when in full operation. The Goodale quarries have never as yet proved a paying working, but the deposit of marble is large and of excellent quality, barring an excessive hardness, making it more difficult to dress. A former company, capitalized at $100,000, failed to find profit in the quarries, but it is no criterion to judge whether or not the new company will surmount the many discouragements and inaugurate a paying permanent business.

The prehistoric monuments of France, England and Germany have been carefully recorded. The first American archaeological map is that of Ohio, on which in three years the Curator of the Ohio Archaeological and Historical Society has located more than 5,000 village sites, mounds, fortifications and graves, while probably 10,000 remain to be put down.

A local stone-cutters' union has been incorporated at Columbus, O. The incorporation papers state that the corporation is formed to promote co-operation and harmonious action among local stone-cutters, to secure mutual interest and secure limitations of the hours of labor as may tend to promote physical and intellectual well being, to protect every member against oppression, and to secure just rights and privileges, and to correct any abuses that may affect the trade.

Proposals for about 300,000 large granite paving blocks of granite equal to the best Cape Ann or State of Maine granite were received by the street department of Boston. The Pigeon Hill Granite Company offers them at $45 per thousand blocks; the Rockport Granite Company at $44.90; S. & R. J. Lumbard at $47; the Cape Ann Granite Company, $44.90, and Dunbar Bros., $48.50.

At San Francisco the stone-cutters' union rules require eight hours for five days and four hours on Saturday, at the rate of 50 cents an hour or $4 a day.

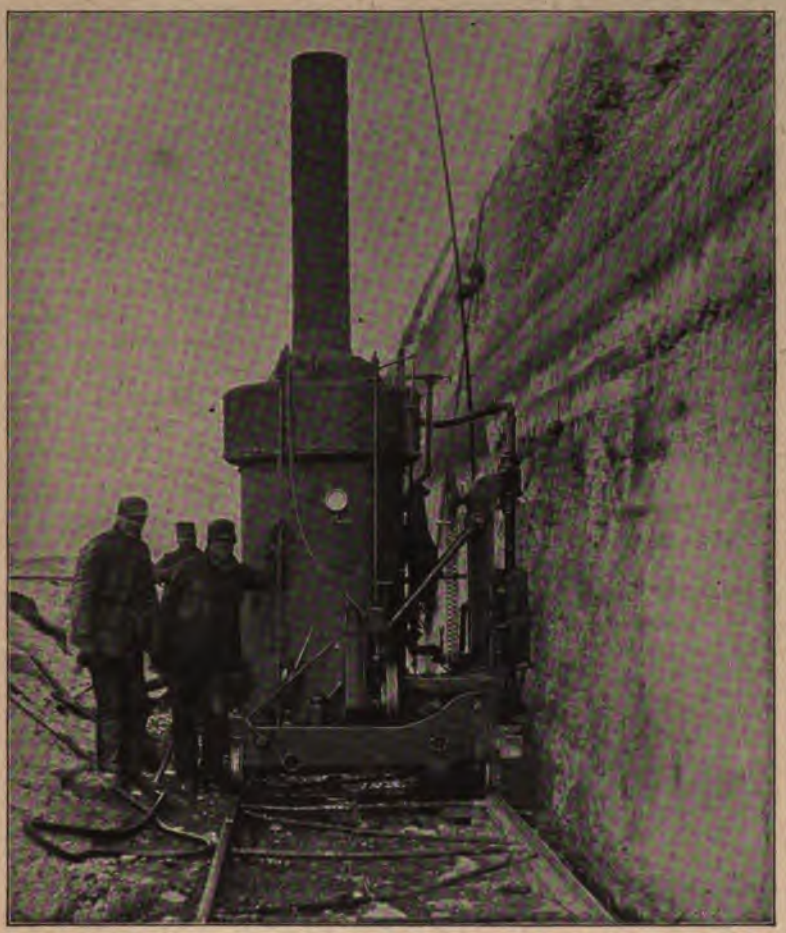
Marbles are manufactured from the material which gives them their name. At the marble quarries the refuse stone is broken by hand into small cubes. A bushel or more of these is poured into a great revolving cylinder, which is supplied with water from a faucet. The cylinder is revolved at a high rate of speed, and the cubes, by attrition, are ground down to the tiny spheres which give such delight to the hearts of the boys. From one to two hours are usually required to finish a lot of marbles, and they are afterward sorted according to size and painted by hand. The crockery marbles, or "potteries," are molded of the same material as ordinary earthenware, and are then glazed and baked. The glass marbles containing images and flowers are molded.

The stone and quarry committee of the Chamber of Commerce will do well to lose no time in getting the quarry owners of the state together for a concerted effort to enlarge the market for the stone product of the state, says the Denver (Col.) *Times*. The Rockies are full of as fine building material as the Vermont hills, and the material should be made equally famous, even if that has to be accomplished by a temporary sacrifice in prices.

At a meeting of the Folk Lore Society, of Baltimore, Md., an interesting paper was read upon "Some Paleontological Folk Lore of Maryland," by Mr. Arthur Bibbins, professor of geology at the Woman's College. The paper

SULLIVAN

Channelers and Gadders!



THE SULLIVAN CARRIAGE CHANNELER USED ON DRAINAGE CANAL

55	Sullivan	Channelers	in use	on Chicago Drainage Canal.
80	"	"	"	in Vermont Marble Quarries.
27	"	"	"	in Southern Marble Quarries.
20	"	"	"	in Sandstone and Limestone Quarries.
15	"	"	"	in New York Marble Quarries.

ROCK DRILLS of all sizes and for all purposes. DIAMOND CORE DRILLS for testing mineral or quarry lands

Sullivan Machinery Co.,

Main Office, 54 to 60 N. Clinton St., CHICAGO. Eastern Office & Works, CLAREMONT, N. H.

treated of fossil cycadean trunk from the Potomac formation of Maryland. The formation extends across the state in a belt from twelve to fifteen miles wide in a northeasterly and southwesterly direction, and forms in part the foundation of the cities of Baltimore and Washington. One of the most notable conceptions concerning them is that they are a sort of stone plant, endowed with a species of life and the capacity in a marked degree for growth. A legend concerning a large specimen resembling a huge honeycomb and belonging to the museum of the Woman's College, which was found in the valley of Stony Run, in the Maryland depression, is that it was discovered when a small stone by one Aunt Polly Jones, in 1830, and carried in her apron a distance of not less than two miles. The stone was planted by her and since then has grown until it now weighs 121½ pounds.

The largest block of marble ever quarried in Tennessee was recently shipped from the Hawkins county quarries. The block weighed 25,200 pounds and was hauled to the railway on a truck drawn by twelve mules.

E. C. Johnson, of New York, manager of the Nixon Red Slate Company, Middle Granville, says the company is now preparing to push the production of slate in all the quarries the coming spring and summer.

San Francisco, Cal.—Eugene Dumontelle, 25-29 De Boom st., who has been in the marble business here for years, was attached 8th inst., by the Vermont Marble Co. for $3,300.

St. Paul, Minn.—Charles Rosengraw, has begun an action in district court, to recover the sum of $5,034 damages for loss of one eye while employed at the quarry of the J. D. Moran Manufacturing and Contracting Co., the defendant company.

Columbia, Pa.—William A. Bruch, slate-roofer, reported to have given judgment for $386.

Kansas City, Mo.—C. M. Ensminger, marble, reported to have given deed of trust of real estate for $1,500.

Cincinnati, Ohio.—John Boyle, stone-yard, reported to have recorded chattel mortgage for $1,870.

SAMPLES OF CHILLED STEEL for sawing and upon application. Towsend & Townsend, 156 Fifth Ave., New York.

Bangor, Pa.—Northampton Slate Co., sheriff has levied on the quarries and mills of company, to satisfy a claim of $22,150 held by Andrew Bruch, trustee, to the use ot the bondholders of the company.

San Jose, Cal.—The Western Granite and Marble Co., at meeting held recently, levied an assessment of $5 per share upon the capital stock of the corporation, payable immediately in United States gold coin to the secretary of the corporation at the office, 370 to 378 North First street.

Haverhill, Mass.—Drinkwater & Bates, marble, etc., reported to have recorded chattel mortgage for $442.

Meriden, Ct.—The Middlesex Steam Brownstone company held its annual meeting recently and elected the following officers: Directors H. Wales Lines, F. W. Ranney, George E. Marsh, George J. Grossman. The officers elected were: President, George J. Grossman. Secretary and Treasurer, George E. Marsh.

The annual meeting of the Connecticut Granite Manufacturers' Association was held in New Haven, Conn., Feb. 2, and the election of officers resulted as follows: President, Calvin S. Davis, Niantic; First Vice President, William Booth, New London; Second Vice President. E. Mower, Roxbury Station; Third Vice President, Thomas Casey, Groton; Fourth Vice President, Robert Shearer, New Haven; Fifth Vice President, E. S. Grant, Stony Creek; Sixth Vice President, M. D. Buckley, New London; Secretary, C. F. Stoll, New London; Treasurer, Henry Gardner, Millstone.

Milwaukee, Wis.—Assignee A. R. Hamilton, on behalf of the creditors of the Menominee Falls Quarry Co., is endeavoring to establish creditors right to property of said company against claim of Mr. Hadfield, the company manager.

The Norton Reed Stone Company, of Bedford, Ind., filed articles of incorporation, with a capital stock of $5,000.

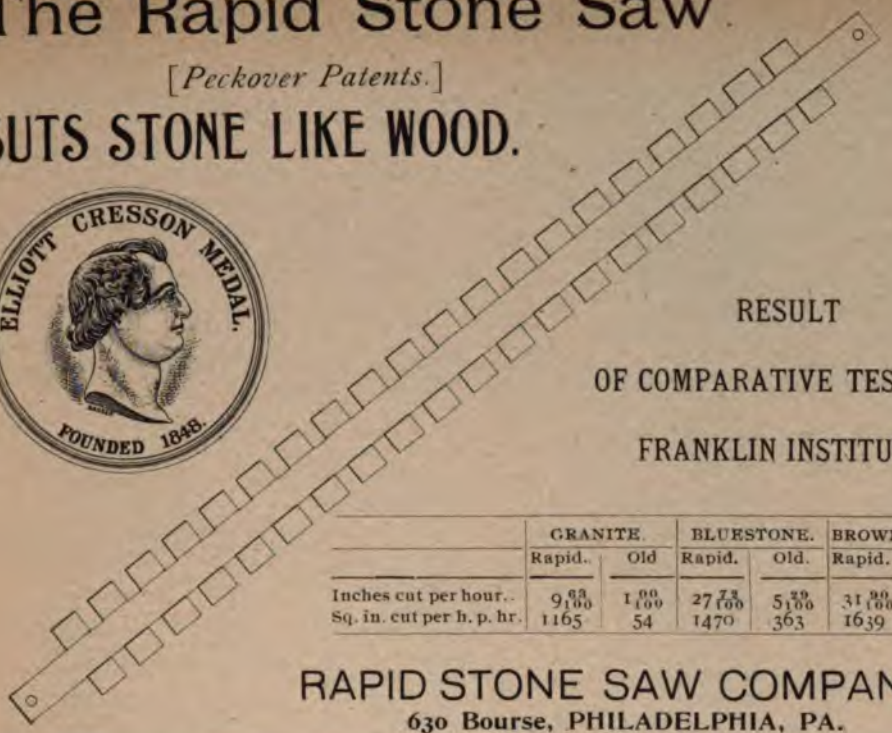
Col. O'Neil, of Webb City, Mo., has organized a company with a capital of $50,000 to erect a plant on his coal lands, consisting of crushers, washers and coke ovens. Work will be commenced in the spring.

Genessee Quarry Company, Milwaukee, Wis., is announced; capital, $40,000. Incorporators, George A. Abert, S. Kleiser and John Cook.

The Rapid Stone Saw

[*Peckover Patents.*]

CUTS STONE LIKE WOOD.



RESULT

OF COMPARATIVE TESTS BY

FRANKLIN INSTITUTE:

	GRANITE.		BLUESTONE.		BROWNSTONE.	
	Rapid.	Old	Rapid.	Old.	Rapid.	Old.
Inches cut per hour..	$9\frac{68}{100}$	$1\frac{00}{100}$	$27\frac{73}{100}$	$5\frac{39}{100}$	$31\frac{80}{100}$	$5\frac{38}{100}$
Sq. in. cut per h. p. hr.	1165	54	1470	363	1639	276

RAPID STONE SAW COMPANY,

630 Bourse, PHILADELPHIA, PA.

NATHAN C. HARRISON,

63 Savin St., Roxbury District, BOSTON, MASS.

1,000 Customers Wanted to use

Harrison Brothers'

CELEBRATED....

Diamond Grit
Chilled Shot or
Iron Sand

For Very Fast Sawing and Polishing of Granite, Marble, Onyx, Glass, Etc.

Sole agent in the United States and Canada for the *Quarry*, the leading English stone trade journal. This journal is published monthly, and is really the only journal that deals with the Stone, Marble, Granite, Building and Contracting trades of England, Scotland, Ire and and Wales. Send for sample copy.

Also sole agent in the United States and Canada for John Smith's Patent Stone Saws. These saws are constructed of steel. No wood about them. Send for photos and specications.

Also agent for P. Fortin, Paris, France, Emery and Putty Powder Manufacturer.

Please mention STONE when you write to advertisers.

The Atlas Slate Company, of Northampton county, Pennsylvania, was granted a charter by the State Department on Tuesday; capital $10,000. The quarry is located in the Danielsville section.

William Edwards of the firm of Cable & Edwards, granite manufacturers, Barre, Vt., died Feb. 13th.

Katsbaan, N. Y.—The limestone quarries on the Van Steenburgh and Winne properties, in this place, are being prepared for an opening in the spring by Legrand Davidson. Derricks forty to fifty feet high, weighing from two to four tons, are being raised into position. They are to be operated by steam engines, three of which will be used in the beginning. A well is being dug and a steam pump will be introduced. A reservoir with a capacity of 30,000 gallons is built, and a railroad track will be laid from the quarries to the "People's Road" where the stone will be shipped.

Salem, O.—A partnership has been formed by A. J. Strawn and John Lowthier, who will open a new stone yard on the vacant lot in the rear of Howell's blacksmith shop in Lundy street. The new yard will be started as soon as the stone which has been ordered shall have arrived.

The opening of new stone quarries at Mantonville, Minn., has already commenced and many buildings will go up in the spring, it is believed.

On the farm of Berry Neece, at Coldwater, near Paris, Tenn., is a quarry of marble that is pronounced to be of a fine quality. It is free from seams and imperfections and takes a nice polish. Specimens will be exhibited at the Centennial.

The death of Dr. Alfred P. Steckel, a lifelong resident of Slatington, Pa., is recorded. He was a leading physician and business man and identified with the quarry interests of that place.

The Georgia Slate Company has recently opened a new slate quarry on the Garner place, near the E. & W. road at Greenway. Tests so far are reported satisfactory and deposit practically inexhaustible. It promises to be a paying industry.

COLUMNS, PILASTERS ITALIAN STATUES AND MONUMENTS Townsend & Townsend, 156 Fifth Ave., New York

Columbia, Mo.—The Boone County Coal Company has been organized as a result of the investigations reported as being made by Wisconsin parties. Extensive mining operations will be inaugurated as soon as railroad facilities are secured, and arrangements for this latter have been completed. Haskell Withers, of La Crosse, Wis.: J. S. Merchant, of Black River Falls, Wis.; and William McMillen, of Neilsville, Wis., are interested. Three thousand acres of land cover the property. Machinery will be bought at once. They expect to employ 300 men.

Tipton, Ind.—Frank McKeown, of the firm of McKeown & McKeown, dealers in marble and monuments, has been prospecting in Tipton this week. He is talking of locating here next April. If he does he will remove the Kokomo branch of the marble shop to Tipton and the firm will be McKeown & McKeown.

Lafayette, Wis.—John Rice, of this town, has recently discovered white sandstone on his farm in extensive quantities.

Chicago, Ill.—The board of directors of the Western Stone Co., held a meeting, Feb. 12th, and elected officers for the ensuing year, as follows: Martin B. Madden, president; Geo. H. Monroe, vice president; T. A. Heineman, treasurer; and J. E. Lindquist, secretary.

St. Louis, Mo.—Kate Brennan filed suit for damages in the sum of $5,000 against Edward Kincaly & Bros., who operate a rock quarry on Florissant avenue and Twenty-second street. Her husband, she says, while employed by the defendant, received injuries which resulted in his death.

East Longmeadow, Mass.—Durantaye & Rankin, quarry, reported advertised to sell out.

Dover, Pa.—J. W. Spahr, stone cutter, reported to have given judgment for $1,175.

Waverly, O.—The Waverly Stone Co., organized here about six years ago with a capital stock of $5,000, went into the hands of receiver David Lorbach, Feb. 22nd. Liabilities from $8,000 to $10,000; assets less than half the latter amount.

Cleveland, O.—The Cleveland Stone Company filed in the County Recorder's office a mortgage for $75,000 on its quarries, some of which are located at Peninsula, this county. The mortgage is in favor of the Guardian Trust Company.

THE WARDWELL

Steam Stone Channeling AND Quarrying Machine

The original and first Stone-Channeling machine ever invented. Will pay for itself in a short time in the reduced cost of getting out stone. *Has no equal for efficiency and economy of operation.*

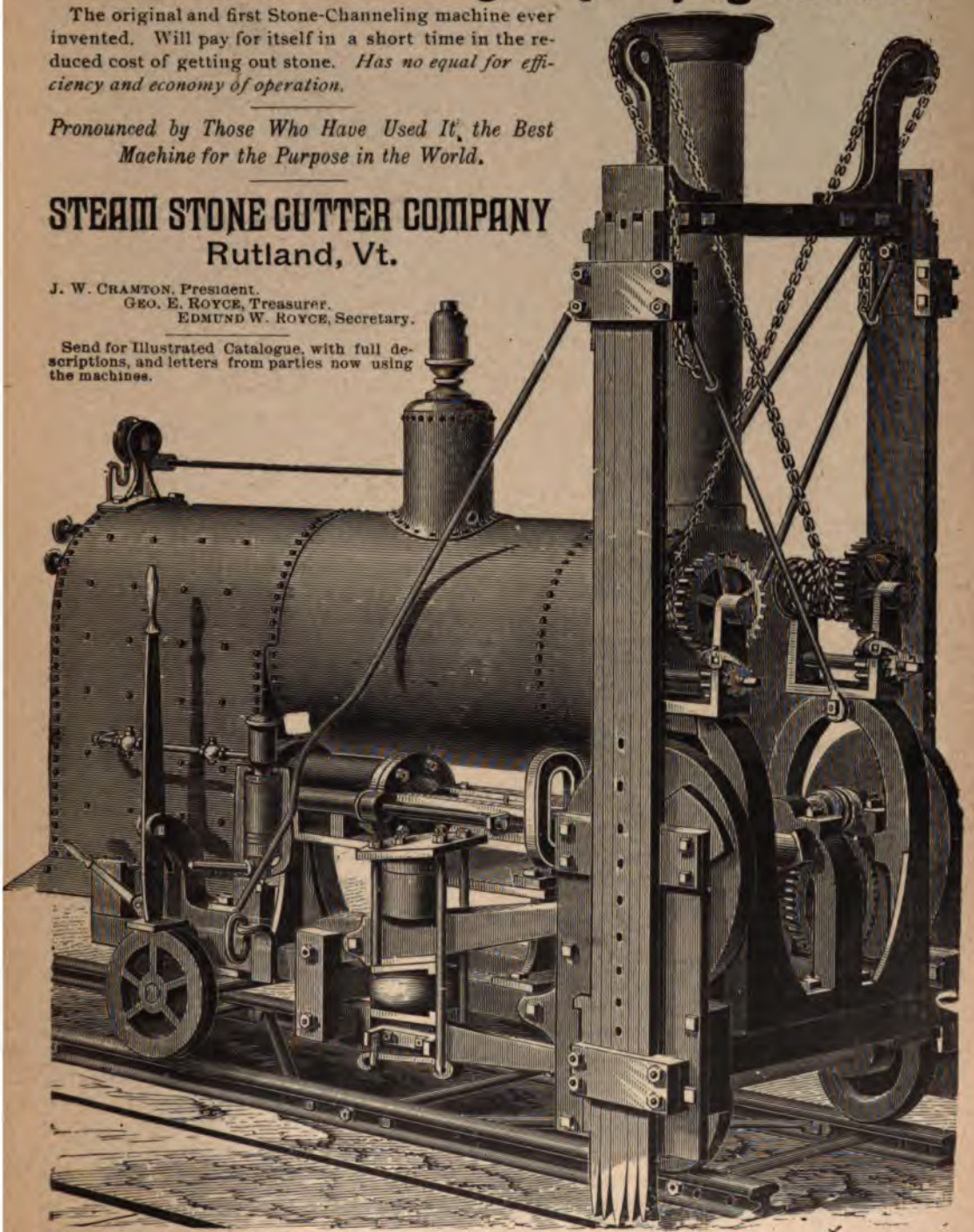
Pronounced by Those Who Have Used It, the Best Machine for the Purpose in the World.

STEAM STONE CUTTER COMPANY

Rutland, Vt.

J. W. CRAMTON, President.
GEO. E. ROYCE, Treasurer.
EDMUND W. ROYCE, Secretary.

Send for Illustrated Catalogue, with full descriptions, and letters from parties now using the machines.



Seymour, Ind.—A verdict for $1,300 damages has been returned against the Consolidated Stone Company, at Bloomington, growing out of the accidental death of Sanford Brown, an employe. The company will appeal from the decision to the Supreme Court.

Warren, O.—The Niles Marble and Granite Company Jan. 20 elected the following officers to serve the coming year: Directors, L. W. Sanford, M. J. Flaherty, J. S. Caldwell, Jno. S. Kennedy, H. D. Holcomb, Wm. Herbert and Henry Jones. President, M. J. Flaherty, vice president, H. D. Holcomb; secretary and treasurer, Wm. Herbert; manager, Jno. S. Kennedy.

An effort is being made to reorganize the Bangor Superior Slate Company, whose quarry and mill are located between Bangor Junction and West Bangor, Pa. It is desired to have the capital stock of the new company fixed at $40,000 and $13,000 have been subscribed.

The annual meeting of the Middlesex Quarry Company, Cromwell, Conn., was held Jan. 21 and five directors were elected. The directors elected the following officers: President, Ferdinand Gildersleeve; general manager, H. A. Cornwall; assistant general manager, A. C. Goodrich.

The Madison (Ky.) Monumental Works were sold at assignee's sale to David Stevenson. Krebs & Co., of Louisville, were the principal creditors.

The Genesee Valley Bluestone Company, of Portage, N. Y., report: Capital stock, $100,000; actually issued, $72,000; debts not to exceed $30,000; assets equal at least $93,324.69.

The Enterprise Stone Works, of Vincennes, Ind., closed down Jan. 23, throwing out of employment seventy-five men.

The stone-cutters of Duluth have decided to restore their regular scale of wages, to take effect on April 15. On account of the dull times and lack of work they have been working for 35 cents an hour for quite an extended length of time. The regular scale calls for 40 and 45 cents an hour.

About thirty members of the Retail and Wholesale Marble Dealers' Association of New England and the Provinces met Jan. 26 for their eighth annual meeting and banquet in the parlors of the American House, Boston. The following officers were elected: President, John Kelley, Braintree; secretary and treasurer, William A. Sommers, Boston; vice-presidents, Stephen Maslen, Hartford, Conn.; James E. Stanton, St. John, N. B.; Oliver M. Wentworth, Boston; John S. Treat, Portsmouth, N. H.; Alonzo T. Farnum, Providence, R. I.; John E. Staples, York, Me.; Redfield Proctor, Rutland, Vt.; directors, George A. Cummings, Concord, N. H.; E. R. Morse, Proctor, Vt.; John J. Love, Webster; George William Green, Woonsocket, R. I.; Thomas Adams, Rockville, Conn.; George B. Baxter, Fredericton, N. B.; George E. Morrison, Biddeford, Me.

R. Robertson & Co. have secured the contract for building the new Wayne county court house for $636,569. The building will be constructed of Berea sandstone and granite.

Lee, Mass.—Twenty-five cutters have returned to work at the Gross quarry. Gray & Son, owners of the works, have reached an amicable settlement with the local stonecutters' union in a dispute reported to have been caused by a matter of trifling importance.

Lee, Mass.—Articles of incorporation have been drawn up between F. S. Gross, James E. W. Bryning and Vincent J. Rambo under the name of the Stockbridge Marble Company, with a capital stock of $20,000. The company will operate the Freedly quarries in West Stockbridge.

Peekskill, N. Y.—The Mohegan Granite Quarrying Company, of New York City, has been incorporated. The capital is $10,000, and the directors are Eugene M. Rudiger, of Peekskill; Evelyn P. Roberts, of Sing Sing, and John M. Rudiger, of Floral Park, Long Island. A quarry a few miles east of Peekskill has been leased by this new company. There is a scheme on hand to build a narrow-gauge railroad from the quarries through Peekskill to the New York Central and Hudson River Railroad tracks, to transport the granite, a distance of four miles.

Alexandria, Va.—The New Era Mineral Company, incorporated; Mr. K. Kemper as agent, and T. U. Stewart, of Washington, president. To buy and operate mines and quarries and to carry on a business of dressing and selling stone, etc. Capital stock, $50,000.

Toledo, O.—Wernert & Burr, stone, L. Wernert deceased.

Rock Crusher Economy

THE CHAMPION STEEL ROCK CRUSHER, WITH ELEVATOR AND SCREEN.

There is economy in figuring, if you figure right. Before buying a Rock Crusher do a little figuring, not only as to first cost, but as to cost of operating, and probable cost for repairs.

When you figure don't fail to include the **Champion Crusher** the cheapest crusher on the market to operate. Built in several sizes. Seven to thirty tons per hour capacity.

GOOD ROADS MACHINERY CO.,

Mention STONE. **Kennett Square, Pa.**

Catalogue is free for the asking. It will interest you.

THE PULSOMETER STEAM PUMP

"The Contractor's Friend."

OFTEN IMITATED——NEVER EQUALED.
OVER 20,000 IN USE.

Recent Important Improvements.

The Handiest, Simplest, and Most Efficient Steam Pump for General Mining, Quarrying, Railroad, Irrigating, Drainage, Coal-washing, Tank-filling, Paper Mill, Sewer and Bridge Contractors' Purposes, etc., etc.

Muddy or gritty liquids handled without injury to the Pump.

PULSOMETER STEAM PUMP CO.,

Catalogue on Application. Correspondence Solicited.

135 Greenwich St., - NEW YORK.

The Marble Hill Quarry Company, of Jersey City, to quarry, mine and deal in marble and other stone. The total capital stock is $350,000, and business will be commenced with $100,000. Following are the incorporators: E. deF. Simmons, James A. Bennett, Frank C. Paucher and Jesse D. Abrahams, of New York, and Joseph C. Davis, of Maplewood, N. J.

Winnebago City, Minn.—W. A. Bessinger will engage in the marble and monument business in this city. His address is Albert Lea, Minn.

Milwaukee, Wis.—Another stone quarry has been started eleven miles west of Berlin, near Spring Lake, by James Shaw and Thomas Anderson of Berlin. They are engaged in getting out paving blocks, employing a force of twelve men.

Elmira, N. Y.—A strip of quarry land owned by Calvin J. Cowles, of North Carolina, has been purchased by the Seneca County Railway Company. Land lies on the west end of South Waterloo and is full of valuable building stone.

Brazil, Ind.—Charles Murray will engage in the marble and monument business at this place.

Beaver, Pa.—Rem Engle, of Industry, exhibited samples of building stone recently discovered on his property at that place. The strata was bared by a washout in a ravine during a storm last summer. Engle is in communication with several prominent contractors and it is likely that a quarry will be opened on an extensive scale.

Guilford, Vt.—Thomas G. Evans, of Johnsville, N. Y., has formed a company here with Herman Lamb, Greenfield, Mass., and F. H. Lowrey, of Manchester, N. H., as partners, to produce slate from the Parsons quarry. It is said a large amount of capital will be invested and much modern machinery purchased at once.

Montpelier, Vt.—Parks Bros. have sold their dark granite quarry to Daniels & Nelson. The reported price is $600.

Gloversville, N. Y.—The stock of Nelson & Dietz, marble and granite dealers of Johnstown, was sold Jan. 19 to Hunter & Grant of Gloverville.

George H. Miller, W. J. Young and W. P. Messinger have leased the quarry of Miller & Allen, in Bushkill township, Pennsylvania, formerly operated by Miller, Brown & Co. They will soon begin operations under the firm name of the Lehigh Slate Company.

Kingwood, W. Va.—W. W. Shock, of Rowlesburg, has bought the bluestone quarries here. The purchase also includes the Bishop quarry. Extensive improvements are to be made.

Wilmington, Del.—Delaware Steam Marble Works bought marble yard owned by Leslie W. Megowens.

The Woodbury (Vt.) Granite Company, now located at Hardwick, will probably change its location to Woodbury this spring.

P. M. and W. E. Jones, of Monson, Me., have purchased the plant owned by the Dirigo Slate Company.

Baltimore, Md.—Charles W. Gaddess, member of the firm of Gaddess Bros., marble workers, died here Jan. 19.

Calais, Me.—New Brunswick Red Granite Co., damaged by fire at a loss of $3,000; covered by insurance.

A. D. Flora, formerly of the Madison Monumental Works, will open a new establishment in Richmond, Ky., in the near future.

Montpelier, Vt.—Charles A. Smith has purchased the interest of W. R. Weston in the marble manufacturing firm of Smith & Weston, and the partnership formerly existing has been dissolved.

Newark, N. J.—Fire completely destroyed the steam stone works of H. J. Hoerner & Co., the 17th inst. The loss is estimated at $20,000; insurance, $7,000. Most of the machinery will have to be replaced. Fifty men are forced into idleness.

Brainerd Stone Company, at Chicago: capital stock, $25,000; general contracting; incorporators, H. F. Daugherty, James B. Beckett and Michael F. Sullivan.

Wauseon, O.—Messrs. Harter & Rohrs have purchased the Wauseon Marble Works owned by W. H. Sohn.

Holland, Mich.—Albert J. De Vries has sold his stone quarry to Williamstown parties.

John Cole and R. Haskins, of Masthope, Pa., have dissolved partnership in the quarry business. Cole purchased Haskins' interest.

GATES ROCK AND ORE BREAKER

SEND FOR CATALOGUE No. 1.

GREATER EFFICIENCY - GREATER SIMPLICITY
GREATER CAPACITY

GREATEST ON EARTH

GREATER NUMBER IN USE
GREATER DURABILITY - GREATER ECONOMY

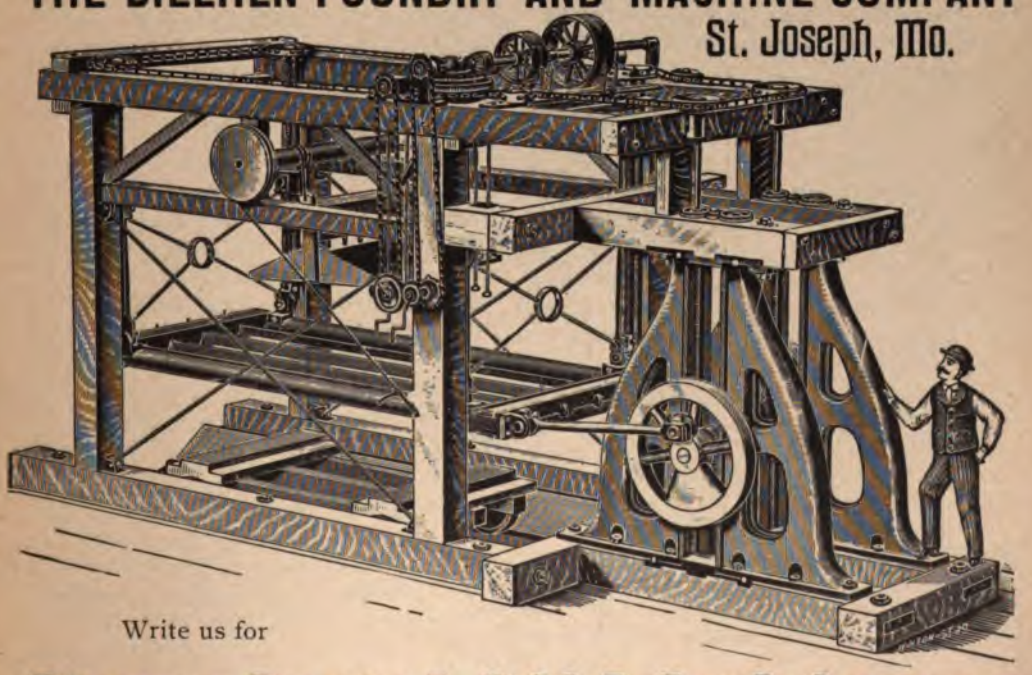
WE HAVE DESIGNED AND ERECTED THE LARGEST AND MOST SUCCESSFUL CRUSHING PLANTS IN EXISTENCE.

Agents for { Hadfield's Manganese and Chrome Steel Manufactured by Taylor I. & S. Co. Most durable for all crushing machinery.

Great Improvements this Season
Lower Prices . . . . . .
ALL KINDS OF MINING MACHINERY.
SEND FOR CATALOGUE.

Gates Iron Works
DEPARTMENT T.
650 Elston Avenue, CHICAGO, ILL.

THE BIELHEN FOUNDRY AND MACHINE COMPANY
St. Joseph, Mo.



Write us for

Stone Saw-Mill Machinery

Foley Bros., of Olean, N. Y., have purchased the Allen Peck Marble and Granite Company's business in Bradford, Pa., and will continue the same. Philip Heysel will have charge of the plant.

Spokane, Wash.—Niles & Vinson, marble and granite dealers of Walla Walla, will locate in this city.

Westerly, R. I.—Maurice W. Flynn and Edward Kelcher, partnership agreement, to do a general granite business.

Decaturville, Tenn.—J. A. Parsons is making arrangements to open a marble-working establishment here.

Theodore Eck will establish a stone yard at Franklin, Ind., in the near future.

Davenport, Iowa.—Lennan & McCaffrey, marble cutting business.

Gt. Barrington, Mass.—A stock company has been organized with a capital of $60,000, to operate the Goodale marble quarries located about a mile west of Sheffield. The company is composed mostly of Cleveland capitalists. James Carpenter is the agent of the company in this vicinity. From one hundred to two hundred men will be put to work as soon as weather permits. Extensive deposits of fine marble are reported to exist here.

Newark, N. J.—William Passmore died, 18th inst., at Olive, Cal. Mr. Passmore was born in London, Eng., in 1828. He was connected with the marble business for a number of years and at the time of his death was senior member of the firm of Passmore & Meeker, marble dealers.

Beaver, Pa.—Chas. Stahl, quarryman, died here 7th inst., of stone-cutter's consumption. The deceased operated a quarry on the N. Y., W. & C. R. R.

Mr. George L. Miller, well known granite manufacturer, died at his home in West Quincy, Mass., Feb. 15, aged fifty-eight years. He was a native of Quincy. He was with the firm of Frederick & Field for sixteen years prior to engaging in business in 1875, when he formed a partnership with the late Harry S. Luce, under the firm name of Miller & Luce, and for the part twenty-two years had been engaged in an extensive monumental business.

Denver, Col.—E. C. Betts, of Pueblo, has been making exhibits of attractive specimens of marble received from a newly discovered quarry located within two miles of Salida. The find is vari-colored and possesses the qualities essential to profitable use. Mr. Betts proposes to open operations upon a scale that will require the use of a channeler and much other quarry machinery.

Santa Anna, Texas.—Mr. David Hughes, a contractor from Fort Worth, who has the contract to furnish stone for the new Santa Fe depot at Galveston, has opened up a fine rock quarry here and made the first shipment 12th inst. The stone he is using is a light blue sandstone and is said to be adapted to ornamental and durable work. The supply of sandstone and limestone is said to be inexhaustible here.

Boston, Mass.—A new joint commodity tariff on marble and granite has just been issued on the Fitchburg line, and its western connections, effective Feb. 15, from Boston to Chicago, and, on the same basis to other Western points west of the western termini of the trunk lines by all rail fast lines. The new rate is: Fourth class, 24 cents; fifth class, 21 cents; sixth class, 17 cents. The rate expires March 31.

Hughes Bros. & Bangs, of Syracuse, N. Y., who own the Bellevue (Del.) quarries, are making extensive preparations to furnish the stone required in the construction of the new Delaware harbor. Railroad facilities, blacksmith shop, water compressor plant, and other additions are at once to be made.

Monson (Me.) people report that more work will be done in their slate quarries the coming season than ever before, and that the Monson-Maine Slate Company will reopen the Oakland and Kineo quarries within a few months.

Richmond, Va.—The Richmond Granite Co., has had Charles Todd appointed receiver for the Gallego Mills. Bond fixed at $25,000.

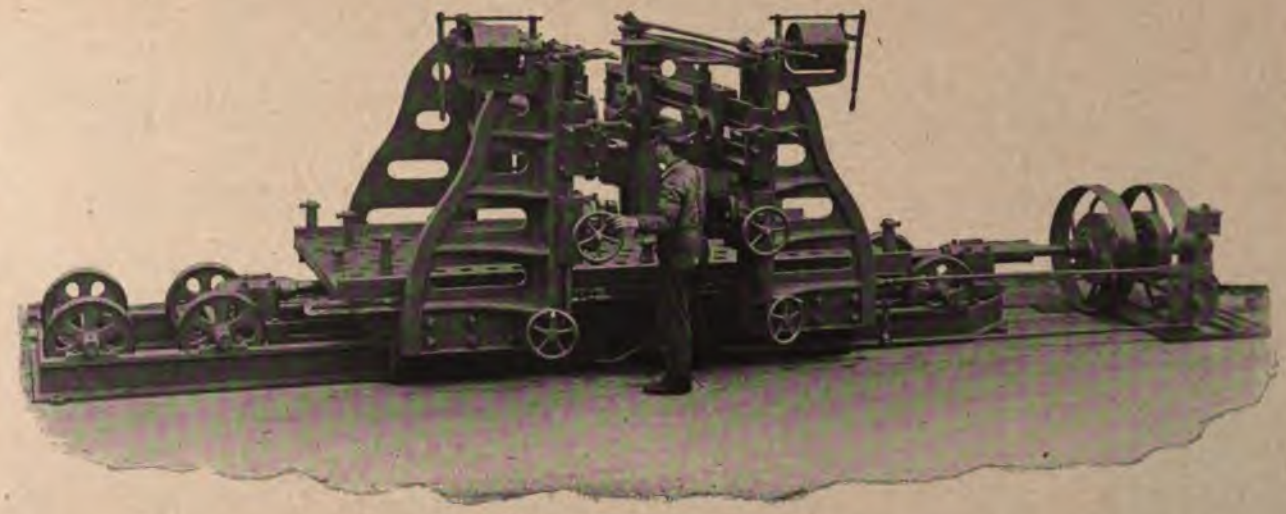
Bangor, Pa.—A meeting of the creditors of the Acme Slate Company was held recently. The leading creditors expect to buy in the property and reorganize.

Bedford, Ind.—The Reed quarries at Oolitic were sold on 15th inst., at Commissioner's sale to Fred. D. Norton for $16,750. The Reed quarry in Monroe county was also transferred to the Oolitic Stone Company, consideration $11,070.

Washington, D. C.—Caspar F. Geier, marble, reported to have given deed of trust for $105.

Double and Single Head Stone Planers a Specialty.

Gang Saws.



Rubbing Beds, Etc.

F. R. PATCH MFG. CO.

Send for Catalogue B.
Mention STONE.

RUTLAND, VERMONT, U. S. A.

The Georgia-Quincy Granite Company, of Macon, Ga., has secured the contract to furnish $187,000 worth of stone for the government jetty work in Cumberland Sound. It will take three years to finish the contract, furnishing twenty carloads of stone daily.

Detroit, Mich.— The Amberg Granite Company, of Chicago, recently notified Chairman Richert, of the supervisors, that it would erect a county building of granite, two stories, with a Berea superstructure, for $631,000, which is $5,000 less than the bid accepted recently. If the company is allowed to cut its granite at the grounds, and nothing but the Berea in Detroit, it will do the work for $619,000. The Amberg company bid was received too late to be presented to the supervisors.

The Eaton Stone Quarry and Oil Company, Ft. Wayne, Ind., met Feb. 6 and elected the following officers: President, R. L. Romy; vice president, James L. Romy; secretary and treasurer, W. E. Mossman.

Albany, N. Y.—The firm of Andrew McMurray & Son, stone-cutters and contractors, Feb. 4 made an assignment to John Kirkpatrick, for the benefit of their creditors.

Joseph H. Shull, of Stroudsburg, Pa., has had an execution for $3,969.16 issued against the Champion Slate Company, whose quarry is situated near Delabole, Pa.

The annual meeting of the stockholders of the East Bangor Consolidated Slate Company was held at East Bangor, Pa., Feb. 6, when the old board of directors was re-elected as follows: S. C. Smith, of Phillipsburg, N. J.; John P. and T. S. Wood, of Philadelphia; George R. Givens Hon. Henry Green and T. F. Emmens, of Easton; W. D. Kern, of Martin's Creek; G. M. Shipman, of Belvidere, N. J., and William Bray, of East Bangor. The board organized by electing S. C. Smith, president; William Bray, superintendent and treasurer; B. W. Ribble, secretary.

Springfield, Ohio.—Israel H. Kelly, monuments, reported to have recorded chattel mortgage for $871.

Brownsville, Pa.— T. S. Wright's Sons, marble, reported to have given judgment for $8,830.

York, Pa.—William H. Witta, stone and lime, reported to have given judgment for $152.

Salina, Kan.— W. D. Edwards, marble yards, reported to have given bill of sale for $100.

NEW JERSEY CAR AND EQUIPMENT CO. Lake View, N. J.

STANDARD GAUGE EQUIPMENT FOR SALE.

One 10"x16" cylinder, Saddle Tank Locomotive, price $900.

Two 10"x14" cylinder, Inclosed Steam Dummy locomotives, price $750 each.

These engines have just been through our shops, and are in A1 order

Seven Contractors' 5 cu. yds. capacity side dump cars, dumping either side. Good as new. Price, $45.00 each.

Fourteen four-wheel Trucks, in good order.
One large Steam Shovel, has had little usage.

Locations for Industries.

The name of the Chicago, Milwaukee & St. Paul Railway has long been identified with practical measures for the general upbuilding of its territory and the promotion of its commerce, hence manufacturers have an assurance that they will find themselves at home on the Company's lines.

The Company has all its territory districted in relation to resources, adaptability and advantages for manufacturing, and seeks to secure manufacturing plants and industries where the command of raw material markets and surroundings will insure their permanent success

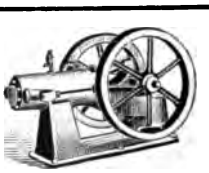
Mines of coal, iron, copper, lead and zinc, forests of soft and hard wood, quarries, clays of all kinds, tanbark, flax and other raw materials exist in its territory in addition to the vast agricultural resources.

The Chicago, Milwaukee & St. Paul Railway Company owns 6,168 miles of railway, exclusive of second track connecting track or sidings. The eight states traversed by the Company, Illinois, Wisconsin, Northern Michigan, Iowa, Missouri, Minnesota, South Dakota and North Dakota, possess, in addition to the advantages of raw material and proximity to markets, that which is the prime factor in the industrial success of a territory—a people who form one live and thriving community of business men, in whose midst it is safe and profitable to settle.

A number of new factories and industries have been induced to locate—largely through the instrumentality of this Company—at points along its lines. The central position of the States traversed by the Chicago, Milwaukee & St. Paul Railway, makes it possible to command all the markets of the United States. The trend of manufacturing is westward. Confidential inquiries are treated as such. The information furnished a particular industry is reliable.

Address,

LUIS JACKSON,
Industrial Commissioner, C. M. & St. P. R'y,
435 Old Colony Building, CHICAGO, ILL.



Gasoline Engines....

For pumping water from quarries this is the best most reliable and cheapest engine.
Catalogue free.

The VAN DUZEN GASOLINE ENGINE CO., Cincinnati, O.

STONE and MINING MACHINERY.

Stamp Mills,
Concentrating Machinery.
Smelting Machinery.
Lixivating Machinery.
Cyanide Machinery,
Rock Breakers,
Engines and Boilers.

Traveling Cranes,
Derricks,
Derrick Powers,
Planers,
Lathes.
Wire Rope and Fittings.
Rubbing Beds.

Manufactured by

H. H. SCOVILLE & CO.,

CHICAGO,

TELEPHONE MAIN 4805.

250-252-254 South Clinton Street.

LINCOLN IRON WORKS

Rutland, Vermont.

New York Office: 803 Havemeyer Bldg.

Manufacturers of

STONE-WORKING MACHINERY

Gang Saws, Diamond Saws, Planers, Rubbing Beds, Derricks, Block Cars, Tile Machines, Saw Dogs, Hoisting Powers, both Steam and Belt.

Estimates furnished on complete Plants, including Buildings, Engines, Boilers, etc.

Arithmetic for Stone Dealers.

Calculations Made Easy,
Errors Avoided,
Time and Labor Saved by

Ropp's
COMMERCIAL
CALCULATOR.

The most useful, complete and *practical* work on Figures ever published. Specially useful to stone, marble, granite and slate dealers and quarrymen. Nearly every problem in business *already figured out.* Arithmetic made so plain by *original*, short and simple methods, that a child can comprehend it. Worth its weight in gold to young and old. Nearly half a million copies sold. Accompanied by account book, silicate slate, pocket, etc. Bound in elegant leather, pocket size. Address

THE D. H. RANCK PUB. CO., 358 Dearborn St., Chicago.

Sent by Mail on Receipt of Price, $1.

Kansas City, Mo.—Missouri Valley Cut Stone Works reported to have been sued for $240.

Montello, Wis. — Attachments have been made on about all the monuments, stones in process of finishing, on the horses, and about all the personal property of the granite company's property here to satisfy the claims of a number of business men and employes. The work at the quarry is at a standstill at present. Just how long the company will allow it to remain so is not known.

Philadelphia, Pa.—Heilimann & Thomas are building new marble works in this city.

Scranton, Pa.—Aaron James, has started a marble cuttiug works at Bellevue Heights.

Chicago, Ill.—Mr. Phillips has purchased for the Chicago and Naperville Stone Company, of which he is president, forty-seven acres at McCook station, at the junction of the Calumet Terminal and the Santa Fe railroads. It is the intention of the Chicago and Naperville Stone Company to erect a crushing plant on this land at once for the purpose of furnishing crushed stone for the improvement of streets and for concrete purposes.

Theo. Eck has established a stone yard at Franklin, Ind.

Bradford J. Blanchard and Sons of North Uxbridge, Mass., have incorporated as the Blanchard Bros Granite Co. The officers are: President, William D. Blanchard; treasurer, R. H. N. Blanchard; secretary, C. Edward Blanchard. Their purpose is to quarry and sell granite There are 150 shares and a capital stock of $15.000.

New York, N. Y.—The Gastone Manufacturing Co., has been incorporated by J. O. Kaliske, S. S. Kaliske, Fred. K. Sonneburn and others; to deal in building stone. Capital stock $50,000.

Burlington, N. J.—Articles of incorporation of the Standard Construction Co., have been filed. Capital stock $100,000. Incorporators are: Charles F. Houseman and Henry V. Massey, of Philadelphia, and Ex-Senator Mitchell R. Perkins, of Beverly.

Centerburgh, Ohio.—W. H. Brokaw, marble, damaged by fire at a loss of $2,000; insured for $1,500.

Newark, N. J.—Reily McLaren's stone dressing works, destroyed by fire at a loss of $12,000; insur ed.

SECOND-HAND PLANERS

Especially Adapted for Stone.

60 in. Pond Planer, planes 25 ft. long, heavy.
48 in. Wood & Light Planer, planes 10 ft. long, heavy.
38 in. Pond Planer, planes 10 ft. long, medium.
37 in. New York Steam Engine Co. Planer, planes 12 ft. long, heavy.
36 in. Pond Planer, planes 16 ft. long, heavy.
30 in. Pond Planer, planes 7 ft. long, medium.
30 in. Pond Planer, planes 8 ft. long, heavy.
28 in. Putnam Planer, planes 8 ft. long, heavy.
24 in. Flather Planer, planes 6 ft. long, heavy.
24 in. New Haven Planer, planes 6 ft. long, medium.
24 in. Putnam Planer, planes 7 ft. long, medium.
25 in. Huebner(Screw) Planer, planes 5 ft. long, medium.

We also have a lot of SECOND-HAND LATHES suitable for turning pillars, posts, etc., both stone and marble, 6 to 40 inches diameter, and any length.
Kindly write us and we will give you valuable information.

Prentiss Tool and Supply Co.

115 Liberty St., NEW YORK.
Chicago Store, 63 and 64 South Canal Street.

Increase your Sawing and Reduce the Cost by Using

"KRUSHITE."

Cuts Faster, Lasts Longer, Gives Better Results than Any Other Material (See Prices Current.)

A Trial will Demonstrate its Qualities.

FRENIER & LeBLANC, RUTLAND, Vermont.

N. W. GODFREY,

Miner and Shipper of **Silica,**

Washed and Screened.
THOMAS & ECKERSON, AGENTS.
New York Office, 33 an 35 West Thirtieth Street.

VANDUZEN STEAM JET PUMP
THE BEST IN THE WORLD.
Pumps Any Kind of Liquid.
Always in Order, never Clogs nor freezes. Every Pump Guaranteed.
10 SIZES.
200 to 12000 Gallons per Hour.
Cost $7 to $75 each. Address
THE E. W. VANDUZEN CO.,
102 to 108 E. Second St., Cincinnati, O.

The Vulcan Iron Works Co.

TOLEDO, OHIO.

REPRESENTING OUR "LITTLE GIANT" STEAM SHOVEL AT WORK IN STONE QUARRY.

These Shovels propel themselves, and so easily that they are indispensable in stone quarry, brick yard, high ways, or general contract work, having a capacity of 800 to 1,200 cubic yards per ten hours with a 1¼-cub. yard dipper. We also make the "Giant" Steam Shovel, which is built on standard gauge trucks, carries a 1¾-cub-yard dipper, and has a capacity of 1,800 to 2,200 cubic yards.

HOISTS AND DERRICKS

OF STRICTLY THE BEST DESIGN.

STEAM,
ELECTRIC,
BELT,
HORSE AND
HAND
POWER
HOISTS.

STEEL OR
TIMBER,
GUY,
STIFF-LEG,
TUBULAR,
CRANE AND
TRAVELLING
DERRICKS.

CATALOGUE.

AMERICAN HOIST & DERRICK CO.

ST. PAUL, MINNESOTA.

CHICAGO, 90 So. Canal St. NEW YORK, Havemeyer Building. CINCINNATI, Carew Building.

Omaha, Neb.—Articles of incorporation have been filed with the county clerk by the English Plaster works. The business of the corporation is the mining of gypsum, stone and cement, and manufacture of all kinds of plaster, cement etc. The incorporators are: O. B. English, Arthur English and Belle M. English, the capital stock being fixed at $30.000.

Davenport, Iowa.—Cass & Lowran succeeded to the marble business of Malloy & Cass.

La Grange, Ind.—The firm of Platt & Hays, marble dealers, has been dissolved, Mr. Hays retiring.

Mr. L. G. Weidner has purchased a working interest in a dark Barre stone quarry at Barre, Vt.

Seneca Falls, N. Y.—The firm of Babcock & Thomas, quarrymen, has been dissolved by mutual consent, Mr. Thomas retiring.

P. M. and W. E. Jones, of Bangor, Me., have purchased the buildings, machinery and quarry of the Dirigo Slate Company, Monson, Me.

Detroit, Mich.—Batchelder, Read & Co., stone yard, reported to have been succeeded by Batchelder, Wasmund & Co.

East Longmeadow, Mass.—Durantage & Rankin, mill and stone quarry, sold at auction for $13,300, and purchased by David Durantage who will continue the business.

The Portland Stone Company, of Worthy, Ind., a small town near Newport, has received the contract to furnish the stone for a $40,000 court house at Lewiston, Ill.

Madison, Wis.—The contract labor problem has been made a subject for consideration in the State Assembly, through a bill introduced by Assemblyman Eaton, which purports to embrace a solution of this much vexed question. The measure provides for doing away with all contract labor on the part of convicts and prohibits them from doing any kind of manufac turing work whereby they come into competition with free labor. Another bill was introduced by Mr. Eaton which provides that in the future convicts shall be employed in breaking stone for public roads around the state.

A verdict of $1,300 damages has been returned against the Consolidated Stone Company, at Bloomington, Ind., growing out of the accidental death of Sanford Brown, an employe.

The Joyce-Cridland Co.

Dayton, O.

Manufacturers of

Patent Lever, Compound Lever, Screw and Hydraulic

JACKS

for Stone-Yard Use.

Illustrated catalogue free.

SPIRAL

Sand Pump

For Feeding Sand, Steel or Shot for

SAWING STONE.

Of all Kinds. Does More Sawing, Uses Less Sand and Water, Requires Less Power and Repairs than any other. Runs only 20 revolutions per minute Pays for itself in Six Months.

FRENIER & LeBLANC, Rutland, Vt.

Stone and Marble Cutters' Mallets

J. B. HELLENBERG,
Coldwater, Mich.

Our mallets are giving splendid satisfaction on all kinds of Stone and Marble. Strictly first-class second growth hickory. Write us for prices, etc.

LIDGERWOOD
Hoisting Engines

Combining All the Latest Improvements,
Also
SUSPENSION CABLEWAYS
For Quarries and General Hoisting Purposes.

LIDGERWOOD MFG. CO.,
96 LIBERTY STREET,
NEW YORK.

26 South Water St., Cleveland, O.
Old Colony Bldg., Van Buren and Dearborn Sts., Chicago.
197-203 Congress St., Boston.
40 North First St., Portland, Ore.
610 North Fourth St., St. Louis.
92-94 First Ave., Pittsburgh, Pa.
15 North 7th St., Philadelphia.
21-23 Fremont St., San Francisco.

SALES AGENTS:
FRAZER & CHALMERS, Salt Lake City, Utah, and Helena, Montana.
HENDRIE & BOLTHOFF MFG. CO. Denver, Col.
ROBINSON & CARY, St. Paul, Minn.

THE NEW ALBANY M'F'G. CO.

Manufacturers of

Steam and Electric Traveling Cranes for any purpose.

Our larger cranes are Especially adapted to

STONE SAW MILL USE.

The smaller electric cranes are very economical for *Storage Yards and Cutting Sheds* in cities where current can be had (by meter) from public power station.

We build all sizes, from *three to twenty-five tons capacity*, and *any width of span* up to 60 feet.

DON'T BUY UNTIL YOU GET OUR PRICES.

We also build

WARDWELL CHANNELERS, STONE PLANERS, SCREW FEED SAW GANGS, HEAVY POWER HOISTS AND DERRICK IRONS.

THE NEW ALBANY MFG. CO., New Albany, Ind.

Cleveland, O., capitalists have discovered along Swan creek, in Branch county, what are said to be the finest deposits of marl in the United States. Large cement works will be erected at Bronson.

The Chicago & Naperville Stone Company, T. P. Phillips, president, has bought forty-seven acres of land at McCook station on the Santa Fe railroad, near the Calumet Terminal junction, Ill. A stone crushing plant will be erected at this point.

Atchison, Kan.—J. W. Waggener has purchased the Hackett rock quarry near the mouth of Whisky creek, and will commence operations there as soon as the weather moderates. He paid $8,000 for the quarry. The stone will be shipped to various points along the Missouri Pacific for riprapping purposes.

WANTED.—Correspondence with competent, practical quarryman, who understands modern machinery. State experience. Address Ozark Stone and Lime Co., 616 Wyandotte street, Kansas City, Mo.

Hughes Bros. & Bangs, of Syracuse, N. Y., have purchased the Bellevue (Pa.) quarries of Mrs. Lizzie Parsons, Cleveland, O. The H. B. & B. Co. will furnish 1,210,665 tons of stone for the substructure and 172,745 tons for the superstructure of the new harbor of refuge in the Delaware Bay. A permanent force of 600 men will be required for the work.

Albany, N. Y.—Andrew McMurray & Son stone-cutters and contractors, assigned to John Kirkpatrick.

Troy, N. Y.—Ausable Granite Works reports capital stock, $100,000; debts not exceeding $150,000; assets, none.

Syracuse, N. Y.—Empire-Park Granite and Marble Company reports stock, $20,000; issued $10,000; debts, $6,200; assets, $10,000.

Quincy, Ill.—August Lange, a stone-cutter, has filed a suit for $1,500 against the F. W. Menke Stone and Lime Company. Lange had his foot crushed by a stone and asks damages for his injury. The Menke company carries accident insurance on their men, but to get anything the court must decide the case and pass on the amount the plaintiff is entitled to.

Troy, N. Y.—Baker Red Slate Company reports capital stock $100,000; debts, $600; assets, $5,000.

THE CONCORD
(Jenny Lind)
Polishing Machine.
MANUFACTURED ONLY BY THE
CONCORD AXLE CO.,
PENACOOK, N. H.
Send for Circular and Price-List.

HOISTING, MINING, BRIDGE ERECTING,
Dock Building, Pile Driving, Coal Hoisting and Quarry Engines
of any power, Sugar Cane transferring engines, transferring machines for depositing cane from car to carrier, with my improved Patent Friction Drums with or without Boilers. Any amount of reference given. Established 1870. Send for Catalogue.

J. S. MUNDY, Newark, N. J. 1744 Market St., Philadelphia, Pa., 22 Light-st. Baltimore, Md., 117 Water-st., Pittsburgh Pa., 349 S. Jefferson-st., Chicago, Ill., 715 N. Second-st., St Louis Mo., 34 Fremont St., San Francisco, Cal., 85 Front-st., Portland, Ore., 4th and Wakouta-sts., St. Paul, Minn., 218 Congress-st., Boston, Mass.

Subscribers

Will do us a favor by sending postal card notice when the magazine fails to reach them. The newspaper mails are heavily burdened and consequently slighted by over-worked post-office clerks, and often go astray. We will always send duplicate copies.

HOISTING MACHINERY FOR QUARRYING,

Mining, Coal Handling, Pile Driving, Bridge Building, Log Hauling, and for General Contractors' Use.

Send for **Illustrated Catalogue** giving full description, etc.

CORRESPONDENCE SOLICITED.

W. A. CROOK & BRO'S CO.,

117-123 Poinier Street.

Newark, N. J.

Salesrooms, 143 LIBERTY ST. NEW YORK.

Improved Electric Hoists, single and double, Patent Friction Drum, compound, geared with brakes and reversible for general Hoisting, Mining Purposes and Suspension Cableways. . . .

Derricks and Hoisting Machines

FOR QUARRYMEN AND CONTRACTORS.

SEND FOR CATALOGUE.

Steam Hoisting Engines.
Horse Power Hoisters.
Hand Power Hoisters.
Derricks.
Derrick Irons.
Sheaves and Tackle Blocks.
Rooter Plows.
Centrifugal Pumps.

Dobbie Foundry and Machine Co.,

NIAGARA FALLS, N. Y.

NEW YORK OFFICE:—38 Dey St.

$150 CASH, and **$200** in finished Granite Monument, or Dimension Stone,

will take in exchange a

$400 New Piano

One of the most popular and highest grade instruments made. Still in wareroom. Address

TRADER, care STONE.

Nashua, N. H.—The Milford Granite Company report to stockholders shows an increase in 1896 over 1895 of $10,509.47 in sales and $21,002.06 in orders, with over $12,000 worth of orders now on hand; earnings to have been a little over 18½ per cent. on the capital stock; 6 per cent. paid in dividends, and the surplus now amounts to $3,088.34.

Cleveland, O.—The old officers were continued at the annual meeting of the Cleveland Stone Company Jan. 27. They are: President, J. M. Worthington; vice president, J. W. Painter; secretary and treasurer, E. A. Merritt; assistant, Charles W. McCormick; general superintendent, James Nichol. One new director, H. C. Ranney, was elected to fill the vacancy caused by the resignation of J. J. Shipherd.

Superior, Wis.—The Superior Cut Stone Company has assigned to G. L. Herrick. Liabilities, $3,000; assets, $12,000. Creditors were pressing the company which could not realize on its accounts due.

Ottawa, Ont.—W. H. Walker, an extensive graphite mine owner, has failed. Claims against the estate amount to $175,000 already.

Westfield, Mass.—David Leonard, granite, reported to have recorded chattel mortgage for $1,032.

Mt. Vernon, N. Y.—Robert Caterson, monuments, etc., reported to have given judgment for $162.

Altoona, Pa.—W. T. Peters, slate roofer, reported to have given judgment for $257.

In the suit of Phillip Fabel, assignee, against A. Peel & Son, Louisville, Ky., the entire stock of A. Peel & Son was sold at public auction on the 1st inst. and was bought in by the Peter & Burghard Stone Company of Louisville. The stock consists of a large stock of granite and marble monuments, markers, headstones, etc.; also derricks, tools, designs and office fixtures.

Joseph H. Shull, of Stroudsburg, Pa., has had an execution for $3,969.16 issued against the Champion Slate Company, whose quarry is situated near Delabole.

Salem, Mass.—Nathan T. Clark, granite, deceased.

New York, N. Y.—Browne, McAllister & Co., granite work, J. S. Browne deceased.

North Tarrytown, N. Y.—S. J. Sackett, marble, etc., deceased.

Hawley's Patent Sand Feed

Is used by all the leading firms—saws faster and better than any other sand-feed. More gangs using our feed than any other. Easily kept in order. Also many gangs working satisfactorily, using crushed steel. Can give best of references.

Orders solicited.

E. J. & C. H. HAWLEY,
Manchester, Vt.

QUARRY PUMPS.

CHEAPEST. HANDIEST. SIMPLEST. PUMPS.

Handling Dirty, Gritty and Sandy Liquids, without Wear, Oil or Care. Pumping outfits for Contractors, Mining, Irrigating, Railroad, Quarry, Drainage and Manufacturing purposes. Second-hand Engines, Boilers, Pumps, and other Machinery always on hand. Exchanging.

MASLINS, 165-167 First St., Jersey City, N.J.

The Publishers' Printing Co.

327 Dearborn Street
CHICAGO

Do all Kinds of

Book and Job Printing

Half-tone work a specialty

☞Send thirty cents in stamps or cash and get a beautifully illustrated Souvenir of "Western Yachts and Yachting."

50 pp. Illustrations
50 pp. Descriptive Matter

WATERPROOF
GRAPHITE GREASE
FOR WIRE ROPES, GEARS, ETC.

An unequaled lubricant which will not wash off. It may pay you to send for circulars.

JOS. DIXON CRUCIBLE CO., JERSEY CITY, N. J.

A. LESCHEN & SONS ROPE CO.,

—Manufacturers of—

All genuine Hercules Wire Rope is made with a Red Strand.

Best on Earth.

[Trade Mark Registered.]

920 & 922 N. Main St., ST. LOUIS, MO.

Send for Catalogue. —CHICAGO OFFICE & WAREHOUSE: 19-21 S. CANAL ST.— Correspondence Invited

BRODERICK & BASCOM ROPE CO.,

—MANUFACTURERS OF—

The Most Durable Rope made.

IT HAS NO EQUAL.

AND ALL GRADES OF

Iron and Steel Ropes and Street-Railway Cables,

ST. LOUIS, MO.

The suit of the National Granite Co. vs. Aug. J. Langefeld and Philip Conrad was brought before the Superior Court, Hartford, Conn., Feb. 3. Mr. Langefeld took a contract to pave South Main street in the city of Waterbury. He bought the paving blocks of the plaintiff, which sues to recover a balance of about $900, claimed to be due it. Mr. Langefeld claims to have sustained certain damages through failure of the plaintiff to carry out its contract with him. Mr. Conrad is made a party defendant as he was guarantor for Mr. Langefeld.

The J. G. Mott Granite Company, Joliet, Ill.; certified to a decrease in capital stock to $25,000.

New Haven, Conn.—The annual meeting of the Connecticut Granite Association, composed of quarry owners, was held in this city Feb. 8, with about thirty delegates present. The officers were elected as follows: President, C. F. Davis, Niantic; secretary, C. L. Stoll, New London; treasurer, H. W. Gardiner, Millstone.

Rockville, Minn.—F. W. Ladd & Co., granite, F. W. Ladd retires.

Gilford, N. H.—The Gilford granite quarry, Andrew R, Smith, will resume operations in the spring.

New York, N. Y.—G. Grob & Son, marble workers, succeeded by Frank Sumner Grob, same style.

Hamilton, Ont.—J. T. Middleton, wholesale granite, etc., succeeded by J. T. Middleton & Co.

Waterloo, N. Y.—The firm of Loren Thomas and Dwight Babcock, quarrymen, has been dissolved. Mr. Babcock will continue the business.

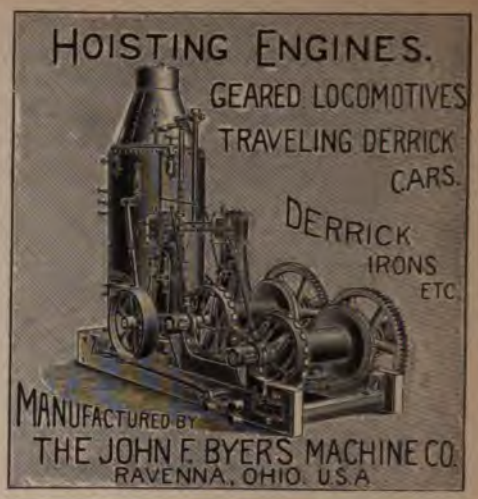
Astoria, Ill.—W. A. Lackey has bought M. J. Donnelley's interest in the marble works here.

Newark, N. J.—Reilly & McLaren's stone dressing works were burned Feb. 4. Loss, $12,000.

Bowling Green, O.—Isaac Hufford has opened a quarry at Stony Ridge.

Hill City, Tenn.—L. D. Webb and James Boyd will shortly start what will be known as the "Mountain City Marble Company."

D. K. Slautterback, has opened a marble shop in Union City, Ind., and will make a specialty of fine monuments and mantels.



THE ACCIDENTS OF LIFE

THE STAR ACCIDENT COMPANY

Write to T. S. QUINCEY, Drawer 156, Chicago, Secretary of the Star Accident Company, for information regarding Accident Insurance. Mention this paper. By so doing you can save membership fee. Has paid over $600,000.00 for accidental injuries.

Be your own Agent.

NO MEDICAL EXAMINATION REQUIRED.

I SEE YOU'RE BACK

from a trip over the

MONON ROUTE

Solid vestibuled trains Daily, heated by steam, illuminated by Pintsch light,

BETWEEN

CHICAGO
INDIAN'POLIS
CINCINNATI
LOUISVILLE
And the SOUTH.

Only line to

West Baden and French Lick Springs,

The Carlsbad of America.

W. H. McDoel, V. P. and Gen. Mgr. Frank J. Reed, Gen. Pass. Agt.

City Ticket Office, 232 CLARK STREET, CHICAGO.

Try

ASHBURTON MARBLE

As a Decorative Material.

COLOR:

Dark grayish purple ground, interlaced with a net work of red and white veins.

CAN BE OBTAINED IN BLOCKS OF LARGE SIZE.
TAKES A BEAUTIFUL POLISH.

It is quarried in Devonshire and shipped F. O. B. Bristol, by

ARTHUR LEE & BROS., LTD.,

Marble and Granite Merchants ....

BRISTOL, - - ENGLAND.

Boston, Mass.—Daniel Magner, marble and granite worker, reported to have recorded chattel mortgage for $650.

Nashua, N. H.—Fuller & Winslow, marble, reported to have recorded chattel mortgage for $500.

Cambridgeboro, Pa.—Jones & Kelly, marble, reported to have dissolved partnership.

Phillipsburg, Pa.—Jas. A. Cooper, marble works, reported to have given judgments for $413.

Monson, Mass.—Deputy Sheriff Cope sold the quarry tools and machinery of William Mitchell at East Longmeadow, at what is known as the Granger quarry, at a foreclosure sale recently, for the benefit of M. A. Glynn.

Hartford, Conn.—James L. Cooke, owner of the crushed stone quarry at Plainville, has sued G. Arthur Hadsell, of Hartford, partner in the Wilson Co., of this city, for stone bought by the Wilson Co. The suit is for $3,000.

Portland, Conn.—The Shaler & Hall Quarry Company met recently and elected the following officers: John H. Hall, president: Frank Brainerd, vice president; Judson B. Brainerd, treasurer; William H. Edwards, secretary; Frederick DePeyster, general manager; Samuel Whitby, superintendent.

Chicago, Ill.—A bill to enforce stockholderst liability was filed Jan. 25 in the Circuit Cour' against Davidson & Sons and twenty-nine stockholders of the corporation. The complainant is the Vermont Marble Company, a judgment creditor of the defendant company to the extent of $2,125. Davidson & Sons ceased doing business July 15 last. The original subscribers to its stock were John A. Davidson, $150,000; Alexander Davidson, $149,700; C. Stedman, $100; Joseph Uhrig, $100, and John Flindell, $100. The two Davidsons, it is shown, attempted to pay for their stock by turning over the assets and good will of the firm of Davidson & Sons. It is asserted, however, that the inventoried assets of this firm were only $160,000. John A. Davidson, it is averred, has made many transfers of stock to other persons, many of whom have not paid anything for their stock. The court is asked to ascertain the amount due from these persons and decree that they shall pay these amounts in satisfaction of the complainant's claim.

Superior, Wis.—The Superior Cut Stone Company assigned Jan. 29 to George L. Herrick. They owned large stone-cutting yards at Tower Bay slip. The assets are $12,000 and liabilities $3,000.

WILLIAMSPORT WIRE ROPE CO.
MANUFACTURERS OF
Iron, Steel and Galvanized
WIRE ROPE
HOISTING AND HAULAGE ROPES
A SPECIALTY.
WILLIAMSPORT, PA.
Correspondence Solicited.

Steger Pianos
CELEBRATED FOR THEIR
Liquid Quality of Tone
Elasticity of Action
Great Durability
STEGER & CO.
MANUFACTURERS
COR. WABASH AVE. AND JACKSON ST. CHICAGO, ILL. U.S.A.

STONE

VOLUME XIV. APRIL, 1897. NUMBER 5.

THE WEST OF ENGLAND GRANITE COUNTRY.—II.

PLYMOUTH bears evident traces of a close connection with a granite country. Granite is not so much in evidence as in Aberdeen, the granite city of the far north. There it may be said to be the only building material. In Plymouth we have much limestone, which it is the fashion to cover with coatings of cement. The streets are paved with marble, for the limestone flags are frequently to be found polished with wear, and after a storm of rain the colors come out as if the paving were veritably of polished marble. Still, for the main buildings of the town, the proximity of the granite quarries of Dartmoor has made the use of the more stable material more common than is usual. The new Guild Hall is a handsome building of which its lofty tower is a conspicuous object. Close by are a fine block of municipal buildings. On the Hoe is "Smeaton's Tower," the old Eddystone lighthouse. This is a granite monument which for over one hundred years stood the storms of the Atlantic on the Eddystone Rock. Planned by the great Smeaton who, it is said, took as his model the trunk of an oak, and built of enduring West of England granite it might still have been standing on the Eddystone Rock but that the rock itself gave way, and thus the stability of the structure was threatened. In 1882 the present Eddystone lighthouse was completed and the old one was re-erected on the famous Plymouth Hoe. From here a magnificent view can be obtained of Plymouth harbor and of the town itself. It was from the Hoe that the men of the West country saw the luckless Spanish Armada sail up the channel. It is said that the great Admiral Drake was engaged here in a game of bowls as the enemy's fleet passed by, and that he finished his game before proceeding to board ship and start in pursuit. The bronze statue of the

Admiral still looks down on Plymouth Sound on the spot where its great original saw the Spanish ships sail by. It was from the Hoe that the ship of Raleigh was espied returning from the ill-starred expedition, which was followed by his execution, and it was from the Hoe at Plymouth that the last greetings were waved to the brave men who sailed in the Mayflower to found across the Atlantic a colony out of which has sprung a mighty nation.

On the Hoe a few years ago a National monument was erected in memory of the victory over the Armada. It is of granite surrounded by a bronze statue of Britannia, and curiously enough a monument to commemorate the stirring times which took place under the reign of Elizabeth was raised under the reign of another English queen.

Near Plymouth is Dartmoor, that great moor which looks more like a billowy sea of land than anything else. It has been aptly compared to a mountain squeezed down and in the process split asunder "till the whole was one hilly wilderness showing ever and anon strange half-buried shapes striving to uplift themselves toward the sky." These "strange half-buried shapes" are the "Tors"—enormous rocks of granite crowning the hills. Hey Tor is a typical example of this formation. This is situated at the end of the moor nearest Exeter, about fourteen miles from that city, and is the scene of the earliest quarrying operations in the locality. London bridge is built of Hey Tor granite. It is a fine-grained stone of a light greenish-gray color. A considerable portion of it is full of large feldspars, frequently as much as two or three inches in length. Very large blocks can be obtained. Some time ago one block measuring some 45x12x12 feet was quarried. At present the granite is worked principally for monumental purposes, but years ago when more of it was used for building, and especially to supply the London bridge contract, there was a granite tramway in existence five miles in length on which the granite was conveyed to a canal and thence to ships loading at Teignmouth. But these are quite modern works compared with those which may yet be traced on the slopes of Hey Tor. Upon these may yet be seen the remains of a group of hut circles which carry the mind back to very ancient times. And the ruins of an ancient road or trackway still traverse the hill from northwest to southeast.

About two miles from Moreton Hampstead is Blackenstone quarry. This has been worked by Messrs. J. Easton & Son for more than forty years. This stone is of a fine base, composed of feldspar in two colors, light pink and light green. The character of the stone is chiefly marked by large feldspars of a light pink color, but these do not appear so well defined as in the Hey Tor granite. Blackenstone quarry is not far from Chagford, and is within easy distance of one of the wildest parts of Dartmoor, that through which the upper part of the river Teign flows.

"In winter," writes a visitor, "Chagford is desolate and almost unap-

PLYMOUTH, FROM THE HOE.

proachable, and if an inhabitant be asked at this season concerning his locality, he calls it in sad tones, "Chagford, Good Lord!" In summer it is picturesque and accessible, and then the exulting designation is "Chaggiford, and what d'ye think?"

Some miles down the Teign, on the eastern side of Moreton Hampstead, is Chudleigh, which is noted for the famous Chudleigh Rock, a mountain of blue limestone which has been extensively quarried under the name of Chudleigh marble. Quantities of marble are also quarried at Babbacombe, near Torquay, one of the most beautiful parts of the Devonshire coast. The bay is bounded by marble cliffs at the foot of which is a beach of white quartzoze pebbles. Viewed from the cliffs the scene is a most beautiful one. The white pebbles reflect the light through a transparent blue sea, while the coloring of the cliffs and of the vegetation, which grows down to the water's edge, completes the picture.

In the heart of Dartmoor is a huge morass—a plastic mass of peat—from which gush a number of springs, the largest of which form the rivers Dart, Teign, Tavy, and Tawe. The part especially from Totnes to Dartmouth is celebrated for its beauty. Two miles from Totnes in a thick wood are the ruins of Berry Pomeroy Castle. It was founded by Ralph de la Pomeroy, to whom the manor was given by William the Conqueror. A portion of the existing building dates from the thirteenth century and is supposed to be the work of Henry de Pomeroy, one of the most powerful barons of the West during the reigns of John and Henry III. The Pomeroys reigned in their castle until the time of Edward VI. when they engaged in a rebellion, which brought them to ruin, and their estates were confiscated. Tradition affirms that the last of the Pomeroys, rather than survive their loss, or faded glories, or do homage to an incensed monarch, blindfolded their horses, mounted them, and spurred them to the southern precipice, on which the castle stands. The terrified animals plunged and resisted, but were urged by their masters over the fatal steep where by one deadly leap horses and riders were instantly dashed to atoms. The castle fell into the hands of the Seymours, and in the civil wars between Charles I. and his Parliament it was dismantled but again occupied in state by Edward Seymour, who headed an uprising against James II. It was here that William III. first halted after landing at Brixham, where a monument to commemorate the event now stands on the pier. After Edward Seymour's death the castle seems to have fallen into decay, and tradition describes its destruction to a terrible storm when it was set on fire by the scathing lightning.

On a part of the moor near Plymouth is Trowlsworthy Tor, where a quarry is worked which is in a somewhat inaccessible situation. The granite is of a red color and in this respect is an exception to the ordinary run of granites in the West of England. It is a handsome stone, but difficulties of

ARMADA MEMORIAL, THE HOE, PLYMOUTH.

transportation and the irregularity of the structure of the rock, have hitherto stood in the way of a considerable working of it.

Some fourteen miles from Plymouth, near Princetown, are Foggin Tor, Great and Little King Tor, Swell Tor, Crip Tor, and Inga Tor. The granite raised in these quarries is principally gray and blue in color, and is largely used for street curbs and for the forts and defenses which have been built around Plymouth harbor.

On the banks of the Tamar, between Tavistock and Callington, is Gunnislake quarry, the property of Mr. Edward Story. Gunnislake granite was used in the construction of the Armada Memorial at Plymouth. The principal granite quarried there is of a silver gray color. It is one of the whitest known granites and of very close texture. Blue, pink, and cream colored granites are also produced from the quarry. A copper lode runs through a remote part of the working, and although the gray granite may be seen running directly against this lode, it gradually assumes a pink or cream color as it nears it. *Arthur Lee.*

ORNAMENTAL WORK.

WHEN a contractor estimates on the cost of carving and other ornamental work, when in stone or in wood, he often runs considerable risk, unless there is a plentiful supply of large scale details to form the basis of his estimate, or unless he is thoroughly familiar with the style in which the architect is in the habit of having his work carried out. In an open competition, where the lowest tender is to be accepted, there is little doubt that the differences between estimates are often largely due to vague drawings or the absence of provisional sums for the ornamental work in the specifications. Marginal sketches in the specifications are great aids to the estimator, and ought to be made more use of than they are—especially in these days of rapid work, when it often happens that there is not time to draw many details before the contract is signed. Contractors should not be asked to spend too much time figuring on a job they may not get, and to aid them the architect should make everything as plain and as easily understood as possible. An inexperienced man who secures a contract in a competition may well doubt if he has not engaged in an unprofitable undertaking; and because of his lack of knowledge, and hurried figuring, may even come to envy those who have given time and thought to the preparation of estimates which have not been accepted. There can be no successful estimate made of carved work if each piece is not dealt with in detail, and this cannot be done if time is not allowed for the purpose.—*Canadian Architect.*

BABBACOMBE BAY. MARBLE CLIFFS AND WHITE PEBBLE BEACH.

PYRAMIDS AND THEIR RELATION TO MONUMENTAL AND SACRED ARCHITECTURE.

MY first subject will be the pyramids of Egypt, second the pyramids or teocalli of Mexico and Central America, and last the pyramidal shaped temples of India.

There is no doubt as to the intended use of the pyramids of Egypt. They were strictly monumental and were erected as a place of deposit for the remains of the person for whom they were built. The theories that they were astronomical monuments, or large storehouses, or memorials of a system of weights and measures intended to be universal, as claimed by some writers on the subject, are not supported by the accounts of the ancients or by the Egyptian inscriptions and other testimony.

The fact that the pyramids are found in the midst of a necropolis, that they contain sarcophagi and mummies, and that the inscriptions on the tombs of many priests mention as a special honor that the deceased officiated at the funeral services held at the pyramids seem to prove that they are tombs and nothing else. As the Egyptian tombs have always borne one and the same character, and only the manner in which they were adorned varied with the tastes of the period, their epoch may be determined with great certainty.

For the first eleven dynasties, or previous to 3,000 years before Christ, the tombs were in the form of a "mastaba," or merely rectangular walls looking like unfinished pyramids, and their interiors were richly decorated with sculptures and paintings referring either to the life of the deceased or to the gods of the current religious system. During the middle empire and until about 1,600 years before Christ, the "mastaba" were superseded by small pyramids and by passages cut in the rocks, and the divinities were seldom represented upon them. In the next period, or until about 340 years before Christ, excavated tombs prevailed and statuary and images of the deceased were superseded by those of a mythological character. The pyramids are only enlarged "mastaba" and as such belong to the first period.

An hour's ride from Cairo carries us back through the vistas of history to the earliest monuments of civilized man. We have the mosque of the 'Ams, the oldest building of Cairo, which has yet seen only twelve centuries pass since its foundations were laid, and we stand before the pyramids of Gizeh which have looked down on the whole course of man's develop-

HAY TOR, THE SUMMIT, DARTMOOR

ment from ages when Phœnician and Greek had not even a name, when the oldest of all the Troys was still in the dim and distant future. At a time when our Aryan forefathers were pasturing the flocks and herds on the steppes of Asia, and when a tent or a reed hut was the highest achievement of architecture everywhere else, in the Nile valley the Egyptians were building those stupendous monuments, which are still the wonder of the engineer, and were painting those frescoes and modeling those statues which represent a stage of civilization to which the Greeks did not attain until thirty centuries later, and which half of the world has not reached even now.

The three great pyramids of Gizeh are the most remarkable and the best known of all those of Egypt. Of these, the first erected by Cheops, or Suphis, as he is sometimes called, is the largest. The next by Chepheren, his successor, is scarcely inferior in dimensions, while the third, that of Mycerinus, is much smaller, but excels the two other in this, that it has a coating of beautiful red granite from Syene, while the other two were cased only with the beautiful limestone of the country. The dimensions of these three as ascertained by the copings are as follows:

Cheops—Side of base, 760 feet; height, 484 feet.
Chepheren—Side of base, 707 feet; height, 454 feet.
Mycerinus—Side of base, 354 feet; height, 218 feet.

Each one was commenced over a sepulchral chamber excavated in the rock, and during the life of the ruler for whom it was intended the work of building up over this chamber went on, a very narrow passageway being kept open as the courses of stone were added by which access from the outside was secured to the central chamber. At the death of the monarch the work ceased and the last layers were then finished off and the passageway closed up. The foundations for the structure were excavated in the solid rock, sometimes to the depth of ten feet, and upon this the great stones were arranged and built up layer upon layer, and one shell succeeding another, and the spaces being filled in with small stones loosely packed. The piles were constructed of blocks of red or Syenitic granite from the quarries of Asswan, and also of others of a hard calcareous stone from the quarries of Mokattam and Turah. They were of extraordinary dimensions, their thickness varying from two feet to more than four feet, and when arranged one upon another, forming steps up the outer slope, the thickness of the stones determined the height of the steps. Those near the top are of thicker stones, but the blocks are of moderate length compared with those at the base. To quarry and remove the immense blocks of stone to the pyramids and then raise them to their respective places required no little engineering skill, notwithstanding an unlimited amount of human labor was at command. Near the summit the number of men that could aid in raising the huge stones must have been comparatively small for the want of room and it seems that

THE DRAKE MONUMENT. PLYMOUTH, HOE.

some mechanical power must have been employed, besides any which we know they possessed. The probability of this is confirmed by the fact that cavities have been found in the stones, which appear as though they might have been worn by the foot of derricks turning in them.

The three pyramids of the Memphis group stand on a plateau about 137 feet above the highest rise of the Nile, not far apart and about on a northeast and southwest line. Like the other pyramids of Egypt, the four sides are directed toward the cardinal points of the compass. The largest pyramid, that of Cheops, covers at present an area of between twelve and thirteen acres. The dimensions have been reduced by the removal of the outer portions to furnish stone for the city of Cairo. Thus despoiled, the walls have lost their smooth, even surface in which state they were left by their builders, who filled in with small stones the angles formed by the recesses of each upper layer and cut away the projecting corners of the great blocks, thus leaving an even surface on each side sloping to an angle of 51 degrees, 50 minutes. By stripping off the outer casing the courses of stone appear in the form of steps, which though ragged and unequal can be ascended even by ladies. The great pyramid has 203 of these steps, the lower ones being four feet ten inches in height. The horizontal surfaces were nicely finished and the stones were joined together with a cement of lime without sand.

The masonry of the Great pyramid consisted originally of over 89,000,000 cubic feet and its total weight is estimated at 6,316,000 tons. Its only entrance is on its north face about twenty-four feet east of its central line, and forty-nine feet above its base line. The masonry about it is much broken away and the piles of broken stone reach from the ground nearly to its level. This passageway is only 3 feet 11 inches high, and 3 feet 5 inches wide. It leads down a slope of 26 degrees 41 minutes a distance of 320 feet 10 inches to the original sepulchral chamber commonly known as the subterranean department, and beyond this 52 feet 9 inches into the rock. This passage is 2 feet 7 inches wide and 2 feet 8 inches high. It is supposed that it was intended to excavate another chamber at the end of this passage, and that it was not done on account of the monarch continuing to live until it was found expedient to close up the mouth of the passage with the external casing of masonry. The sepulchral chamber is 46 feet long, 27 feet wide, and 11½ feet high. At sixty-three feet from the entrance a branch passage connects, which rises at an angle of 26 degrees 18 minutes, and thus extends a distance of 124 feet where it becomes level and extends 109 feet further. This connects with several chambers and passages. One situated nearly in the center of the pyramid and sixty-seven feet above its base is known as the Queen's Chamber. It is 17 feet by 18 feet 9 inches, and 20 feet 3 inches high, and has a groined ceiling. It appears to have been intended for a sarcophagus, but when discovered was found empty, the only sarcophagus

ON THE HOE, PLYMOUTH. (REGATTA DAY.)

found being in what is called the grand or king's chamber. This apartment is 34 feet 3 inches long, 17 feet 1 inch wide, and 19 feet 1 inch in height. It is lined with red granite, highly polished, single stones reaching from floor to ceiling. The ceiling is formed of nine large slabs of polished granite reaching from wall to wall. Above the ceiling are five small chambers built apparently to protect the ceiling of the chamber from the immense weight above it. The room is perfectly plain and contains only a sarcophagus of red granite 7½ feet long, 3 feet 3 inches wide, and 3 feet 5 inches high, which is too large to have been introduced through the passageway, and must therefore have been placed in the room when this was built. It contained a wooden coffin and the mummy of the king, which disappeared when the pyramid was first opened and plundered. In the construction of the pyramid arrangements were made for blocking up the important passages with huge masses of granite, and the obstacles thus interposed have greatly impeded their exploration, and sometimes rendered it necessary to open new passages around the obstructions. It is not improbable that the ancient Egyptians themselves violated the tombs of Cheops, or that Cambyses, the king of Persia, entered it. Arab historians record that the caliph Momman, in the beginning of the ninth century, forced his way into the pyramid in order to rob it of its supposed treasures. He found nothing but empty chambers and a stone sarcophagus containing a wooden coffin which held a richly decorated mummy.

The second pyramid stands on a base thirty-three feet above that of the great pyramid and in an excavation made for it in the rock. It has an angle of 52 degrees 20 minutes. The upper portion of its casing is still preserved. It has two entrances, one 37 feet 8 inches above the base, the other built out in front of the base; each leading by an inclined passage about a hundred feet long to the same sepulchral chamber. This chamber is 46 feet 2 inches long, 16 feet 2 inches wide, and 19 feet 3 inches high, and has a roof the shape of the pyramid. It contains a granite sarcophagus 8 feet 7 inches long, 3 feet 6 inches wide, and 3 feet high. This pyramid was entered by Belzoni in 1818, who found a cufic inscription recording the visit of a caliph and the opening by him of the pyramid A. D., 1196. The only remains met with were those of a bull, the Egyptian god Apis.

The third pyramid, as before remarked, is much smaller than the others. It was explored in 1837 by Col. Vyse, who discovered several apartments in one of which was a highly finished sarcophagus, a mummy case bearing the name of King Menkara and the body of a workman. The last two are now in the British Museum, but the sarcophagus was lost on the passage. This pyramid, though the smallest is the best constructed of the three, the style of the work being more costly than any of the other pyramids of Egypt. In the same vicinity are six smaller pyramids supposed to be the tombs of

NEW MUNICIPAL BUILDINGS, PLYMOUTH.

some of the relatives of the kings who built the larger ones. A pyramid is simply a cairn or borrow, only its stones are laid regularly and their edges are carefully finished instead of being roughly thrown together. The principle of the pyramid is almost always the same. A rocky eminence on a deserted tract of land lying between the Nile and the Libyan hills, and above the reach of the annual inundation, was excavated for the reception of the king's sarcophagus, and a sloping passage was cut to connect the royal sepulcher with the surface. Above the sepulcher, both to protect it from the inroads of the sand and to mark the spot, a large block of stones was erected, almost in the shape of a cube, but slightly tapering or battering towards the top. This was done early in the king's reign, and if he died at this point his mummy was inserted into the tomb, a small pyramidal cap was placed on top of the block, and triangular pieces were added to the sides, and a small pyramid effectually closing the royal sepulcher was then complete. If the king, however, continued to reign, he deferred the cap and sides and instead of them put other blocks around the base, so as to form a second stage upon which he erected another casing to his cube, thus increasing its size. The longer the king lived the larger became his pyramid, so that it is possible to roughly estimate the duration of his reign by the height of his pyramid. It is quite impossible for me to give a minute description of individual pyramids within the scope of this paper. Volumes might be and have been written on this interesting subject and yet it is not exhausted. In this connection I will only refer to one other pyramid —one of the number included in the group of eleven in the second great cemetery of Memphis, the necropolis of Sakkorah. It is known as the pyramid of steps. This pyramid is supposed by some writers to have been built by Uenephes, of the first dynasty. If so it is the oldest monument in the world. It was constructed of an inferior quality of limestone, quarried probably in the neighborhood. Its six steps with the angles not filled up reveal the principle of pyramid building. It has the peculiarity of an oblong instead of a square base, and unlike the other pyramids it is not set square with the cardinal points of the compass.

Pyramids as monuments to the illustrious dead were not confined to Egypt. Ethiopia contributes three groups of monuments in the form of pyramids. The principal group is at a place called Dunkelah, in latitude 17 degrees, north, which is supposed to be the site of the ancient city of Meroe. Another is at Gibel Borkal, and a third is at Nourri, a few miles down the river from Gibel Borkal. Compared with the great Egyptian pyramids these are most insignificant in size. The largest ones in each of the three groups are as follows: That at Nourri is 110 feet by 100 feet at the base, that at Gibel Borkal is 88 feet square, while at Meroe none exceed 60 feet each way. They also differ in form from those in Egypt, being much

BERRY POMEROY CASTLE, TOTNES, DEVONSHIRE.

steeper, as their height is generally equal to their base. They also possess a roll moulding on their angles and each has a little porch or pronaos attached to one side generally ornamented with sculpture, and forming either a chapel or more probably a place where the coffin of the deceased was placed. We learn from a celebrated Greek traveler and historian that so far from concealing the bodies of their dead, the Ethiopians had a manner of preserving them in some transparent substance which rendered them permanently visible after death.

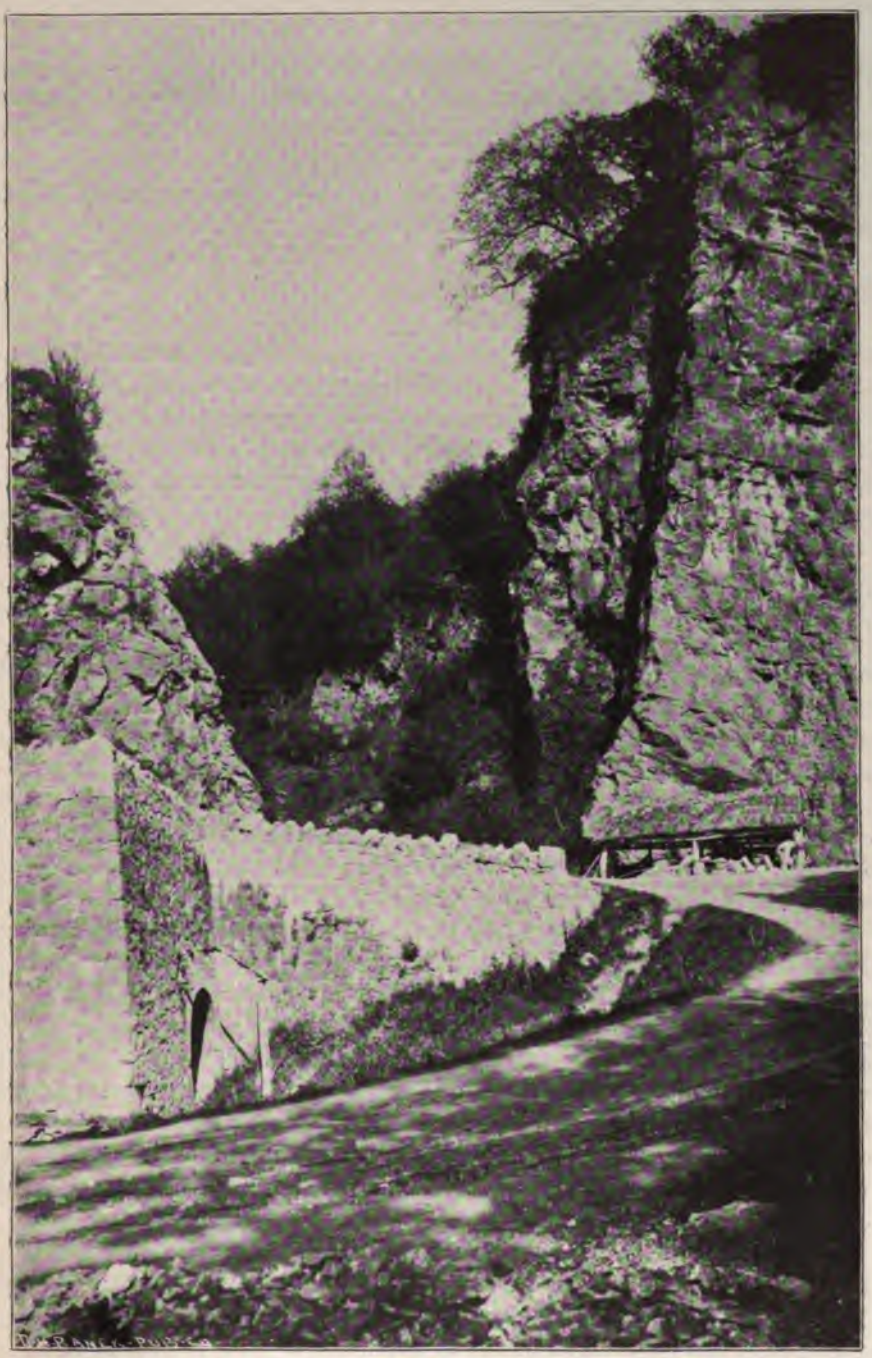
I will close this part of my subject with the following extract from the writings of a learned and enthusiastic writer on Egyptian history. Mr. Stanley Lane Poole, in his valuable contribution to "Picturesque Palestine," says:

"The people who built the pyramids four thousand years before Christ were no barbarians; no nomad tribes of lacustrine peddlers. They were people with a profound philosophy, a lofty religion, a remarkable and individual art, a refined and complex society. If the progress of man from savagery to civilization marched then by the same slow laboring steps as in later times, the Egyptians must have been a nation for thousands of years before they could have built Memphis with its chain of grand sepulchers. It is like standing on the borders of infinitude when we think of this wonderful antiquity.

"The immeasurable ages of geology and the weird traces of primitive man give one an overwhelming sense of insignificance, but these tell us only of a barbaric savage existence with scarcely the beginnings of a higher life.

"The monuments of Egypt show us man living as civilized a life as ever Roman conceived. As civilized in some of the best senses as any life we lead now, and there they stop short and meet us like a closed door, bearing on its threshold the footprints of myriads of inhabitants, but suffering no man to enter and see them. It is not the age of the pyramids that awes one most, but the thought of the unknown past that preceded their mighty birthday. Five thousand years ago they stood where they stand now, but the men who looked upon them belonged to another immeasurable antiquity, when pyramids were not, of which we see the end but not the process, and whereof there remains no record but the result."

In the brisk hustling bazars where the traders and dealers meet to exchange goods, the brown Nile laborer may be seen bringing his produce. In appearance he is much the same being that he was when the pyramids were being built, but now he can neither build nor paint nor write. Turn in to the museum close by and you will see the statues and pictures and writing on the walls, extorted from the grasp of the desert sand which people with the blood of modern Egyptians in them produced in lavish quantities and amazing perfection. A modern "fellah"—one of this very people's descend-



CHUDLEIGH MARBLE QUARRY, DEVONSHIRE.

ants—is looking at the works of his forefathers in stupid wonder. He does not understand them. He knows that he and his countrymen can do nothing like them now. How they ever came to do them and what took away the power of such works from them are some of the questions that crowd upon the mind as we contemplate the stupendous works. Surely "Time mocks all things, but the pyramids laugh at time."

We will now turn our attention to the second division of our subject—the relation of pyramids to sacred architecture.

The most striking adaptation of pyramids or structures of pyramidal form, to the purpose of sacred architecture, are to be found in Mexico and Central America. The conquest of Mexico by the Spaniards under Cortez, in 1521, discovered to the Europeans a civilized people possessing considerable knowledge of the arts and sciences, having an architecture of their own, dwelling in cities protected by fortifications, and possessing a monarchical form of government with well drilled armies, a system of religion with temples, priests and places of sacrifice, codes of morality and laws that would put to shame some of the civilized nations of the present time. The question as to the origin of this wonderful people has, I think, never been satisfactorily settled, nor is it a question for us to attempt to settle. A people commonly called Toltecs is said to have occupied between the fourth and sixth centuries of our era the valley of Mexico. The Mexicans do not pretend to any very remote antiquity or divine descent. There are no heroes who lived thousands or tens of thousands of years, nor any of the extravagancies that usually mark the dawn of history in the Old World. On the contrary, their history modestly begins with the arrival of the Toltecs in Anahuac, and with them the beneficent teaching of a stranger who lived among them, taught them architecture and the arts of agriculture, instructed them in their religious duties, and then left them by sea promising to return. For three or four hundred years the Toltecs lived in peace covering the table land with their monuments. But evil times came. Famine, war and disaster drove them from their peaceful homes and they migrated, it is said, southward toward Yucatan, where, it is usually assumed, they erected the architectural monuments whose ruins are now found in that country. From the departure of the Toltecs until the arrival of the Aztecs in the twelfth century nothing is known politically of the annals of Anahuac. The Aztecs were in peaceable occupation of the country at the time of its discovery and conquest by the Spaniards.

The principal monuments that these people have left behind them are the "Teocallis," literally "Houses of God," the temples of the people. These are pyramids in terraces with flat tops and always surmounted by a chamber or cell which is in fact the temple itself. They seem to be of all ages, for if one may trust traditions that of Cholula is as old as the early

Toltecs, whereas the great teocalli of Mexico was only finished five years before the discovery of America by Columbus, and the Spaniards met with many persons who had assisted in its erection. It has, however, with all the native buildings of the city been swept away by the ruthless bigotry of the conquerors. Of these teocalli, the largest and probably the oldest is that of Cholula. Its dimensions are so far as they can be ascertained in its present ruinous state, 1440 feet square, and 177 feet high, divided into four stories, the fifth being formed by the cell or temple, which has now been replaced by a chapel dedicated to the Virgin Mary. There are two pyramids at Teotihuacan, the largest of which is a square of 645 feet with a height of 171 feet, and there are others at Tezcuco of about the same size and like them divided into five or seven stories, but the most interesting of those brought to light is that of Xochicolo. It is situated on the top of what appears to be a natural elevation, but which has been fashioned into terraces by art. The pyramid itself is in five stories. The stone facing of the three upper stories has been removed to repair a sugar mill in quite recent time, but the two lower stories still retain their sculptures and architectural ornaments. Besides the large many-storied pyramids there are numerous examples in many parts of the country of one story only. Like all others in Mexico it is only a device to raise a temple to such a height as should give it dignity and enable the ceremonies performed on its upper platform to be seen by all the people. It is indispensably necessary to bear this distinction in mind in speaking of these monuments, as careless writers connecting the word pyramid with Egypt are too apt to confound two classes of monuments entirely distinct and dissimilar. The Egyptian pyramid is always a tomb. The principal object of its erection is the sepulchral chamber in its center. It always terminates upwards to a point. In no instance are there external steps leading to a cell or chamber at the apex. In fact they were always tombs, never temples. The Assyrian pyramids, on the contrary, have much affinity with the building of which we are now speaking. They were always in terraces. The upper platform was always crowned with a chamber or cell, and there were external steps leading to this which was the principal object of its erection. If we hesitate to admit that there was any connection between the builders of the pyramids of Assyria and those of Mexico, we must at least allow that the likeness is startling and difficult to account for on the theory of mere accidental coincidence. It is quite probable that primitive man as he slowly emerged from the environments of ignorance, with which his mental powers had been enshrouded, became convinced of an unseen and overruling power. A hidden mystery worthy of admiration. If such were the case the most natural objects of worship would be the objects by which he was surrounded. The sun being the most brilliant, as well as the most potent object that met his

gaze, would be one of the first to commend his adoration. The moon and stars would in turn command his respect, and finally fire as a representative of the sun would become an object of worship. The same elements in nature, acting on minds in a similar condition, would produce similar results. The ancient Assyrian erected a pyramid and on its flat top offered sacrifices to his god in the presence of the entire people. The more modern Mexican having by a similar process of mind reached a similar conclusion to that of the ancient Assyrian proceeds in like manner to erect his pyramid, and upon its broad top to offer his sacrifices in the presence of the assembled multitude. We are informed that the Aztecs were most sincere in the practice of religious rites. They believed in a Supreme Creator, invisible, yet omnipresent, but requiring numerous assistants to perform His will, each of whom presided over some special natural phenomenon or phase of human existence. They had thirteen principal and several hundred inferior deities. Their god of war was a patron divinity of the race, and myriads of human victims were sacrificed to him yearly. In each principal city there was the great pyramid, besides several smaller ones, and it is estimated that there were upwards of 40,000 of these places of worship in the empire.

The Toltec race, whose occupancy of the valley of Mexico preceded that of the Aztecs, is said to have emigrated southward and to have occupied what is now known as the peninsula of Yucatan. As in Mexico, the principal monument of Yucatan is the teocalli, but in this case their design is somewhat different from those in Mexico and they were probably erected for a different purpose. They are not generally in terraces like those of Mexico, but rise at about an angle of 45 degrees, the platform on which the temple rests being reached by a broad flight of steps. The pyramid of Palenque which is one of the most interesting ruins of Yucatan, may have been erected as a palace. The pyramid on which the superstructure is built is 310 feet long, 260 feet wide and about 40 feet high. The pyramid is divided into three parts by sill ribbons. The superstructure is reached by broad stairs on its west side. The buildings erected on the pyramid are one story of 25 feet with flat roofs. Around three courts of different extent are grouped the corridors, halls and rooms. From the one of the five larger entries which extends the most outward, we reach by downward stairs of eleven steps the principal court yard. Most remarkable are the ceilings of the rooms, formed by stone blocks joined one to another and the symmetrical square tower ending after many gradations in a steeple.

Stone sills bound by the perpendicular ribbons, which had freizes with pictorial work between them, divide the different stories. All the masonry had an inward and outward covering of polished stucco, ornamented with strange fantastical pictures. The floors are of stone, joined by cement and covered also with polished stucco. The other temples found in Yucatan

differ but little from this one, except in size, and architecturally speaking they are less interesting than the palaces, the splendor of the temple consisting in the size of its pyramid, to which the superstructure is only the crowning member. In the palace, on the other hand, the pyramid is entirely subordinate to the building it supports, forming merely an appropriate and convenient pedestal, just sufficient to give it a proper degree of architectural effect.

Mexico, Central America and Peru each possess wonderful monuments of architectural skill. By whom they were wrought will probably never be known, as the nations who wrought them left behind no literature by which their identity or connection with the Old World can be established.

The final sub-division of my subject, "The Pyramidal Shaped Temples of India," will not occupy us for a great length of time. The earliest monuments of India are the rock-cut temples which are of themselves so interesting that they will form the subject of a future paper. The structure of the earliest Indian temples was extremely simple. Pyramidal and of larger dimensions, they had no light except that which the door afforded. And indeed the gloom of the cavern seems to have led them to consider the solemn darkness of such a mansion sacred. There are ruins of this sort at Deogur and at a spot near Tarjore.

In proportion to the progress of the country in opulence and refinement their sacred buildings became highly ornamented, and must be considered as monuments exhibiting a high degree of civilization of the people by whom they were erected.

Very highly finished pagodas of great antiquity are found in different parts of Hindostan, particularly in the southern part where they were not subjected to the destructive fury of Mohammedan zeal. One of the most imposing structures of this kind is the pagoda of Chillamboram, near Porto Novo on the Coromondel coast. On account of its antiquity it is held in very great veneration. This monument should perhaps be more properly described as a cluster of pagodas inclosed in a space 1,332 feet in length and 936 feet in width, whose walls are 30 feet high and 7 feet thick, each side being provided with a highly decorated frustrum of a pyramid over the entrance gateway. The pyramids or pagodas which stand over the outer inclosures rise from rectangular bases and consist of several floors. The passage through them is level with the ground. One of the largest temples known is that on the small island of Seringham on the Coromondel coast. It is situated about a mile from the western end of the island, and is thus described by Sonnerat: "It is composed of seven square inclosures, one within the other. Each has four large gates with a high tower (pagoda) which are placed one in the middle of each side of the inclosure, and opposite to the four cardinal points.

The outward wall is near four miles in circumference, and its gateway on the south is ornamented with pillars several of which are simple stones 33 feet long and nearly 5 feet in diameter. Those which form the roof are still larger. In the innermost inclosures are the chapels. The extreme veneration in which Seringham is held arises from the belief that it contains the identical image of the god Vishnu which used to be worshiped by Brahma. The pagoda forms a very prominent feature in the architecture of Burmah. The one at Peguh is octagonal in plan with a diameter at the base of 395 feet and a height of 361 feet. One on the Irrawaddy river opposite Ava is 944 feet in circumference and 160 feet high. The Burmese pagodas are usually square edifices of great extent, the base comprising porticos and central chambers, and terminating upwards in octagonal or polygonal straight-lined pyramids. The pagoda also forms an important feature in the architecture of China. They are of brick covered with marble, or most generally with glazed tile, and are built in stories one over the other, from three, four or five to as many as nine in number. Each story is reduced in width and has a gallery around it. The Chinese temples were frequently raised on a square pyramidal-shaped platform, and in this respect were similar to the temple or palace of Palenque in Yucatan.

Ever since the destruction of the world by the flood there seems to have been a disposition among men of all nations to protect themselves from a similar occurrence by the erection of pyramidal towers, the first notable example of which was the Tower of Babel. The object for which this notable tower was erected having been by Divine Providence frustrated, mankind sought out new objects to which they could turn their attention.

The old kings of Egypt wishing to hand down to posterity some evidence of their power and glory erected immense tombs which have in all ages been the wonder of the world, in the center of which they constructed a chamber insignificant in size, when compared with the whole mass, in which a single sarcophagus was deposited containing all that was left of their mortal remains. The ancient Assyrian and the more modern Toltec and his successor, the Aztec, inspired by religious zeal erect for themselves immense pyramids with the tops truncated into a platform upon which they can offer a sacrifice in adoration of the majesty of God as they understood him, or to appease his wrath when misfortune assailed them. The Hindoo, the Burmese and the pagan Chinese beautified and adorned their temples with massive pagodas beneath whose shadows they offered their prayer, their offerings and their sacrifices to Brahma to Vishnu, or to Siva.

Even the Christian Church has not been altogether exempt from this disposition to worship a Divine Being in places erected and dedicated to his service and ornamented by imposing towers and spires. As the pagan Hindoo of old entered his temple through the ponderous pagoda that adorned

its front so do we of to-day enter our sanctuaries through towers beautifully designed, proportioned and ornamented to chant hymns of praise and to worship the God of our salvation. *Cyrus K. Porter.*

CORPORATION BLACKLISTS.

ONE of the bills now before Congress, which is likely to give rise to no little discussion is that which defines the act of blacklisting men who have taken part in strikes as "a conspiracy against the United States." The object of the bill is to prevent large corporations, and particularly railroad companies, from putting the names of strikers upon their blacklists, and thus largely depriving them of the chance to earn a living. According to reports which have come to us the bill excludes from its benefits all strikers who have engaged in lawless acts in connection with a strike, lockout, or other conflict between labor and capital; but it affirms the right of every wage-earner to leave his work whenever he pleases, and to leave it either by and of himself or in company with a multitude of others.

There can be no question of the essential justice of such a measure. A strike is no doubt frequently an act of folly, which results in damage to the community at large, but that is no reason why the striker should thereafter find himself debarred by corporate influence from obtaining work. A combination of large employers to keep industrious men out of work by way of vindictive punishment is as prejudicial to public welfare as anything that could be well imagined. The men who are thus shut out of all avenues of employment at the trades in which they are skilled are forced to join the already too rapidly increasing army of the unemployed, and add materially to the mass of discontented men. In their discontent, moreover, there is a sense of injustice which will add to its aggressiveness and tend to make it a menace to the general peace and public welfare. A folly is not a crime, and it should not be punished as such. Whenever a striker engages in a criminal act there are laws sufficient to punish him, and no corporation should presume to take the punishment into its own hands. Blacklists no doubt serve a good purpose in some respects, but when they are carried to the extent that a combination on the part of great employers of labor to exclude from employment men who have simply exercised the right of quitting work they become pernicious, and it is time that the strong hand of the law should interfere to prevent such an exercise of irresponsible power.—*San Francisco Call.*

"Herewith I hand you check in payment of two years' subscription to STONE. I appreciate your good work for the cause, but out here with new and unknown properties we have had a terrible struggle. With best wishes for your success—*Jno. L. Burke, Hot Springs, S. Dak.*"

SLATE PRODUCTION IN THE UNITED STATES IN 1896.

THE following from the forthcoming report of Prof. Wm. C. Day, of the Division of Mineral Resources, U. S. Geological Survey, shows the output and value of slate in the different productive states during the calendar year 1896:

STATES.	ROOFING SLATE.		Other purposes than roofing. (Value.)	Total value.
	Squares.	Value.		
Georgia	4,597	$ 20,388	.....	$ 20,388
Maine	19,602	85,923	$ 24,255	110,178
Maryland	15,557	70,194	1,948	72,142
Massachusetts	.....	.....	1,200	1,200
New Jersey	200	700	.....	700
New York	16,002	78,612	3,880	82,492
Pennsylvania	431,324	1,391,539	334,779	1,726,318
Tennessee	160	640	780	1,420
Vermont	155,523	509,681	99,915	609,596
Virginia	26,863	92,163	15,700	107,863
Total	669,828	2,249,840	482,457	2,732,297

The past year has been unprecedented in the history of slate quarrying by reason of the rapid advance in the export trade. Strikes, resulting in suspension of operations and consequent inability to fill orders, at the quarries in Wales, have brought about a demand for United States slate in a number of foreign countries. Foreign buyers of slates have appeared in our markets, while agents of dometic producers have gone abroad to solicit orders. Domestic sales of slate were more curtailed by financial depression than in 1895, so that had it not been for the increased exportation production would have run considerably behind the preceding year, whereas it is somewhat more. Pennsylvania was probably benefited to a greater extent by the increased exportation than any other state, although Vermont came in for a large share.

Tennessee makes its first appearance as a slate-producing state with fair indications of steady growth in this direction as the result of quarrying and milling operations recently inaugurated in Blount county. Some 200 squares of roofing slate from a source in Carlton county, Minnesota, have been applied to roofs with the view of giving the material from this new source a practical trial. Quarrying operations will probably be undertaken in the near future.

The production of milled slate somewhat exceeded that of 1895. This

is, partially at least, accounted for by increased exportation of blackboards. It seems to be generally conceded that American slate has made a favorable impression abroad, and it is to be hoped that the trade which has been gained as the result of temporary exigencies may be permanently retained by virtue of the excellence of our slate and the enterprise and business sagacity of its producers.

Not a little of the material sent to England was reshipped to Australia and South America. Doubtless, efforts to deal directly with consumers in those countries will be made, thus saving much in freight and with corresponding benefit to producer and consumer.

CANADA'S TARIFF ON SLATE.

THE present duty on black roofing slate is 30 per cent., but not to exceed 75 cents per square, so that the duty is 30 per cent. only on slate selling at $2.50 per square or less, which is of the lowest quality. On some of the better qualities of American slate 30 per cent. would give a duty of $1.50, were it not for the specific limit of 75 cents per square. On roofing slate other than black the duty is 30 per cent., but not to exceed 90 cents per square; on red roofing slate, for example, the price is as high as $8.50 to $10.50 per square, on which price 90 cents is only a duty of 8¾ per cent. to 10¾ per cent.; "Sea Green" slate, which does not keep its color, is the cheapest produced, and the higher duty was put on this to stop its use in Canada.

Canadian slate dealers ask that the duty remain at not less than 75 cents per square on black roofing slate and 90 cents per square on other qualities, alleging they cannot compete with the low grade slate produced in the United States. Slate produced in the United States of quality equal realizes as high, and in many cases a higher, price at the quarry in the United States than in Canada.

The duty on slate slab work is also 30 per cent., and they ask that no reduction be made in this, as their slate, being tough and solid, is much more expensive to work into shape than the soft American slate with which they have to compete; and the extra cost is warranted, because, being tough, solid and non-absorbent, it is far superior to the soft and porous American slate for sanitary and similar work, in which it is largely used. Canadian slate compares with American slate very much as hard wood compares with soft, and its extra cost is all in the labor expended upon it.

"You ask for suggestions in regard to your magazine. Well, I have none to offer. I think you are so far ahead of any publication already that any improvements may be safely left with yourselves."—*George Leuchars, Great Falls, Mont.*

VALUE OF DIFFERENT KINDS OF STONE PRODUCED IN 1894 AND 1895.

THE LIMESTONE QUARRIES OF EASTERN NEW YORK, WESTERN VERMONT, MASSACHUSETTS, AND CONNECTICUT*

THERE are in the region given above several well-marked limestone belts presenting sufficiently distinctive characters to permit the following classifications:

1. The dolomite area of Westchester and Dutchess counties, New York, containing the quarries at Sing Sing, Tuckahoe, Pleasantville, and Patterson.

2. The Cambrian limestone belt, including the quarries at Newburg and Stoneco, N. Y.

3. The Helderberg limestones, of importance at Rondout, Catskill, Hudson, and South Bethlehem.

4. The Trenton limestones, with quarries at Glen's Falls, Hoosick Falls, and Whitehall, N. Y., and Fairhaven, Vt.

5. The Stockbridge limestones, quarried at various points between Canaan, Conn., and North Pownal, Vt.

6. The Vermont marble belt, extending from Dorset to Middlebury.

7. The Black River limestone, quarried at Leicester Junction, Winooski, Swanton, and High Gate Springs, Vt.

In these seven areas there are about fifty quarries, most of which are in operation. This does not include small openings which were operated a short time and then abandoned.

1.—THE DOLOMITE AREA OF WESTCHESTER AND DUTCHESS COUNTIES, NEW YORK.

Tuckahoe, Westchester County, N. Y.—The quarries at Tuckahoe are the most extensive, and are all opened in the same stratum, which extends northeast and southwest, and has a thickness of about forty feet. The rock in all is a magnesian limestone of granular character and moderately hard. Its character is quite constant. The rock is used chiefly for making lime, but recently the manufacture of marble dust has been commenced.

Analysis of limestone from O'Connell & Hillery's quarry, Tuckahoe, N. Y.

	Per cent.
$CaCO_3$	70.10
$MgCO_3$	25.40
Insoluble	2.40
Total	97.90

*These notes are furnished with the kind permission of Mr. F. S. Witherbee, president Troy Steel Company, for whom they were collected.

The Tuckahoe Marble Company's quarry is about 400 feet long and 40 feet deep. The output is used for building purposes. The rock in Norcross Bros.' quarry is very similar in character, but the quarry is smaller.

Analyses of limestone from the Norcross Brothers' quarry, Tuckahoe, N. Y.

	No. 1. *Per cent.*	No. 2. *Per cent.*
Insoluble	.....	1.33
Lime	30.16	30.68
Magnesia	21.25	20.71
Carbon dioxide	47.30	46.66
Ferric oxide	.21	.21
Water	.02	.16
Silica	.24	.....
Alumina	.19	.....
Loss	.63	.....
Total	100	99.75

Sing Sing, Westchester County, N. Y.—There are two quarries at Sing Sing. The rock is a granular, fine-grained limestone, and is apt to vary somewhat in composition.

Analysis of limestone from Sing Sing, N. Y.

	Per cent.	*Per cent.*
Silica	6.77	5.94
Iron and alumina	1.81	2.82
Lime	45.02	29.05
Magnesia	3.61	20.05
Phosphorus	.027	.....

Pleasantville, Westchester County, N. Y.—The Pleasantville quarry is the largest quarry in the county. The limestone is remarkably uniform in its character, and on account of its white color and coarsely crystalline character has been called "Snowflake marble." Nearly the entire output of the quarry is used for marble dust.

Analysis of Pleasantville (N. Y.) marble.

	Per cent.
Calcium carbonate	54.62
Magnesium carbonate	45.04
Iron carbonate	.16
Alumina	.07
Silica	.10
Total	99.99

2.—THE CAMBRIAN LIMESTONE BELT.

Newburg, Orange County, N. Y.—There is a small quarry on the southwestern edge of Newburg, Orange county. The rock is a blue, finely crystalline limestone with a marked bedding.

Stoneco, Dutchess County, N. Y.—One of the largest quarries in the state is at this locality. The rock is a hard, fine-grained, siliceous limestone, and the quarry has a working face about 500 feet long and 20 to 40 feet high. The limestone is crushed to many sizes and used for railroad ballast or road material.

3.—THE HELDERBERG LIMESTONE QUARRIES.

The Scutella limestone is of importance, and is worked by several companies. At South Bethlehem the Tentaculite limestone is of importance.

Analysis of Scutella limestone, Hudson Valley, N. Y.

	No. 1. Per cent.	No. 2. Per cent.
Lime	51.40	.....
Calcium carbonate	.....	91.70
Carbon dioxide	41.191	.....
Magnesium carbonate	.....	3.51
Magnesia	2.233	.....
Alumina	.635	1.01
Ferric oxide	1.819	.55
Silica	1.842	1.89
Sulphur dioxide	.145	.049
Phosphorus	.149	.022
Water	.271	.....
Total	99.683	98.731

4.—THE TRENTON LIMESTONE AREA.

Glen's Falls, Warren county, N. Y.—The quarries are well known, and have been in operation for a number of years. They are all situated along the river on the edge of the town, and in common show the following section, beginning at the top:

	Feet.
Thin-bedded, impure black limestone	12–15
Black limestone	2– 3
Fine-grained, black crystalline limestone	15
Total	33

The upper bed is used for building material, and is now also used in the manufacture of Portland cement. The lower fifteen feet are used for making a good grade of lime. In former years much of it was polished, and made a pretty black marble.

Analyses of Glens Falls (N. Y.) lime.

	No. 1. Per cent.	No. 2. Per cent.
Lime	96.46	97.60
Magnesia	.64	.36
Iron and alumina	1.70	.80
Water and carbon dioxide	1.20	1.24
Total	100	100

Analysis of limestone rock, Glen's Falls, N. Y.

	Per cent.
Calcium carbonate	94.98
Iron and alumina	1.26
Silica	2.13
Magnesia	Trace.
Total	98.37

Smith's Basin, Washington County, N. Y.—The rock is mostly dark-gray to bluish-black, fine-grained and moderately hard. Its massive character has been somewhat destroyed by the shearing and folding to which the rock has been subjected. The beds have a general dip to the southeast, and the upper ones in each quarry are more or less shaly and siliceous.

Analyses of limestone and lime from Smith's Basin, New York.

	No. 1. Per cent.	No 2. Per cent.
Lime	54.15	94.07
Magnesia	.39	.79
Carbon dioxide	42.95	3.04
Alumina	.08	.20
Ferric oxide	.02	.07
Silica	.97	1.93
Phosphoric acid	.01	.01
Water	1.47	.....
Organic matter	.06	.....
Total	100.10	100.11

Fairhaven, Vt.—The limestone is not sufficiently massive and homogeneous to permit the extraction of blocks or slabs of moderate size. The chief use now is for flux.

Hoosick Falls, Rensselaer County, N. Y.—Three small quarries have been opened on the hillside to the west of town. The rock consists of irregular beds of slaty, bluish-black limestone, and a lighter-colored, fine-grained limestone. It is very irregularly bedded and its chief application is for road metal and foundations or stone walls.

5.—THE STOCKBRIDGE LIMESTONE BELT.

Around Canaan, Conn., this formation is a magnesian limestone and is important as a source of lime, but farther north, in Massachusetts, it extends from West Stockbridge to North Pownal, Vt., with quite uniform character, being quite rich in lime and having usually a low percentage of silica.

Canaan, Conn.—The rock is a rather coarse-grained, yellowish or bluish white (depending on its depth from the surface) magnesian limestone.

West Stockbridge, Berkshire County, Mass.—The rock is mostly a gray, moderately fine-grained limestone, with occasional white bands. The stone is chiefly used for lime. An analysis of the lime gave lime, 91.12 per cent.; magnesia, 3.81 per cent.

Lee, Berkshire County, Mass.—The rock is a soft, rather fine-grained white dolomite, with streaks of gray.

New Lenox, Berkshire County, Mass.—A coarse-grained, hard, gray limestone, which in certain portions of the quarry may contain micaceous streaks, while the other supplies a soft, white limerock.

Farnham Station, Berkshire County, Mass.—The rock is a gray granular limestone.

Cheshire, Berkshire County, Mass.—The rock is in every respect like Farnham's. An analysis of the limestone gave:

Analysis of limestone from Cheshire, Mass.	*Per cent.*
Silica	0.31
Iron and alumina	.23
Calcium carbonate	98.80
Magnesium carbonate	.37
Organic matter	.35
Total	100.06

Renfrew, Berkshire County.—The rock is a rather soft, white, saccharoidal limestone. The following is the

Composition of limestone from Renfrew, Mass.	*Per cent.*
Calcium carbonate	99.60
Magnesium carbonate	.49
Iron and alumina	.55
Silica	.63
Total	101.27

North Adams, Berkshire County, Mass.—The stone is similar in composition to that at Renfrew, but contains a larger proportion of carbonaceous matter, 25 to 30 per cent. of the rock being a dark gray. There is also a vein of quartz several feet wide down the center of the quarry face. The rock is mostly used for making marble dust.

North Pownal, Bennington, Vt.—Is a hard, gray, fine-grained, massive limestone of moderately homogeneous character.

6.—VERMONT MARBLE BELT.

Most of the quarries in this belt are between Rutland and Middlebury, but a number of openings have been made on Dorset Mountain.

East Dorset, Vt.—The marble is a bluish white, good grade of stone. Most of it is shipped to Philadelphia for building purposes. Several dikes penetrate the marble in the old workings and are known by the workmen as "ore bodies." The Dorset Marble Company's marble is white, with occasional gray mottling.

West Rutland, Rutland County, Vt.—They have made a number of openings following downward on the dip, and so much of the material between them has been removed that they now practically form one enormous quarry extending along the strike for nearly 700 feet and down on the dip for 280 feet. At this depth the bed begins to turn and the dip decreases. The marble bed has a thickness of 150 feet at the top, but narrows to 75 feet at the bottom. It is divisible, however, into well-marked layers, which, though varying somewhat in thickness in different parts of the quarry, retain their distinctive characters. The following section of the quarry from hanging wall to foot wall was kindly given by the superintendent.

Section in marble quarry at West Rutland, Vt.	*Feet.*
Top, blue Top, white	20
Green stripe	2
Thin statuary	3–6
Striped monument	2–6
Statuary	3–6
Average layer, half green, half white	4
Brocadilla	2.6–3
Crinkly (siliceous; half light, half dark)	2–3
Light, Smith Mottled, Smith } Light, nearly pure white	4–6
Jackman layer (6 in. green striped, 2 ft. 6 in. white)	3
Sherman (half dark green, half white)	3–6
Italian blue	15–20
Mottled limestone, of no value	.....

The green color is due to chloritic mica. The chief use of the marble is for monuments.

Analyses of West Rutland (Vt.) marble.

	Blue. Per cent.	White. Per cent.	Statuary. Per cent.
Insoluble	.28	.40	.70
Carbon dioxide	43.82	43.66	43.65
Lime	55.27	55.26	55.50
Magnesia	.28	.15	Trace.
Iron and alumina	.30	.20	.15
Total	99.95	99.67	100

It is interesting to note the slight difference that there is between the blue and the white.

Additional analyses of West Rutland (Vt.) marble.

	Blue. Per cent.	White. Per cent.
Silicate of alumina	.22	.62
Carbon dioxide	44	43.80
Lime	55.15	54.95
Magnesia	.57	.59
Organic matter	.05	. . . .
Total	99.99	99.96

The white and white-striped layers seem to disappear to the north, for at the quarries of the Albertson Company and of the True Blue Marble Company, three-quarters of a mile to the north, only the blue marble is found. These quarries are from fifty to seventy-five feet deep. The marble is a fine-grained, granular, bluish stone, and is used for monumental and structural purposes.

Proctor, Rutland County, Vt.—The best beds seem to dip to the southwest, and the quarrying at the bottom of the pit is trending in that direction. While the different layers are fairly well marked, they are not so persistent in their character as those in the West Rutland quarry. No statuary marble or blue marble is found in this quarry. Most of the blue marble dressed at Proctor comes from the "Mountain Dark" quarry, two miles from Proctor, and from the quarry at Pittsford. The latter is known as the "Pittsford Blue." Most of the marble is converted into tombstones.

Analysis of marble of Proctor, Vt.

	Per cent.
Insoluble	0.35
Carbon dioxide	44.02
Lime	55.00
Magnesia	.25
Iron and alumina	.20
Total	99.82

Additional analyses of marble from Proctor, Vt.

	Light. Per cent.	Dark. Per cent.
Calcium carbonate	96.30	98.37
Magnesium carbonate	3.06	.79
Iron carbonate	.053	.034
Insoluble	.63	.63
Organic matter	.004	.08
Manganese oxide	. . . . .	.005
Total	100.047	99.909

Brandon, Rutland County, Vt.—Quarry is about 50 by 100 feet and 50 feet deep. The marble is mostly white or creamy white, with occasional gray mottlings, and dresses easily. There is one streak four feet wide in the center of the quarry which is said to be too hard to work, and has therefore been discarded.

7.—THE BLACK RIVER LIMESTONE BELT.

The quarries in this rock are at Leicester Junction, Winooski, Swanton, and Highgate Springs.

Leicester Junction, Addison County, Vt.—The workable bed, which is about 40 feet thick, dips to the east between two beds of impure limestone, and the material used is a hard, finely-crystalline, rather brittle, gray limestone.

Analysis of lime from Leicester Junction, Vt.

	Per cent.
Lime	98.262
Calcium carbonate	.409
Magnesia	.299
Silica	.383
Ferric oxide	.647
Total	100

Winooski, Chittenden County, Vt.—The rock is a uniform, finely crystalline, gray limestone, which is at times siliceous.

Swanton, Franklin County, Vt.—The same limestone formation quarried at Winooski is mined one and one-half miles from Swanton. The quarry is of considerable size, but the character of the rock is extremely uniform. It is massive, hard and brittle.

Analyses of lime made at Swanton, Vt.

	No. 1. Per cent.	No. 2. Per cent.	No. 3. Per cent.
Lime	97.47	99.29	98.84
Magnesia	1.12	.46	.12
Ferric oxide	Trace	.12	.....
Silica	Trace	.10	.02
Carbon dioxide	.45	.....	1.02
Alumina and manganese	.....	Trace.	.....
Total	100.04	99.97	100

Highgate Springs, Franklin County, Vt.—The same limestone and so similar to Swanton that no further description of it is required.

Analysis of limestone from Highgate Springs, Vt.

	Per cent.
Lime	55.83
Magnesia	Trace
Iron and alumina	.10
Silica	.40
Carbon dioxide	43.65
Total	99.98

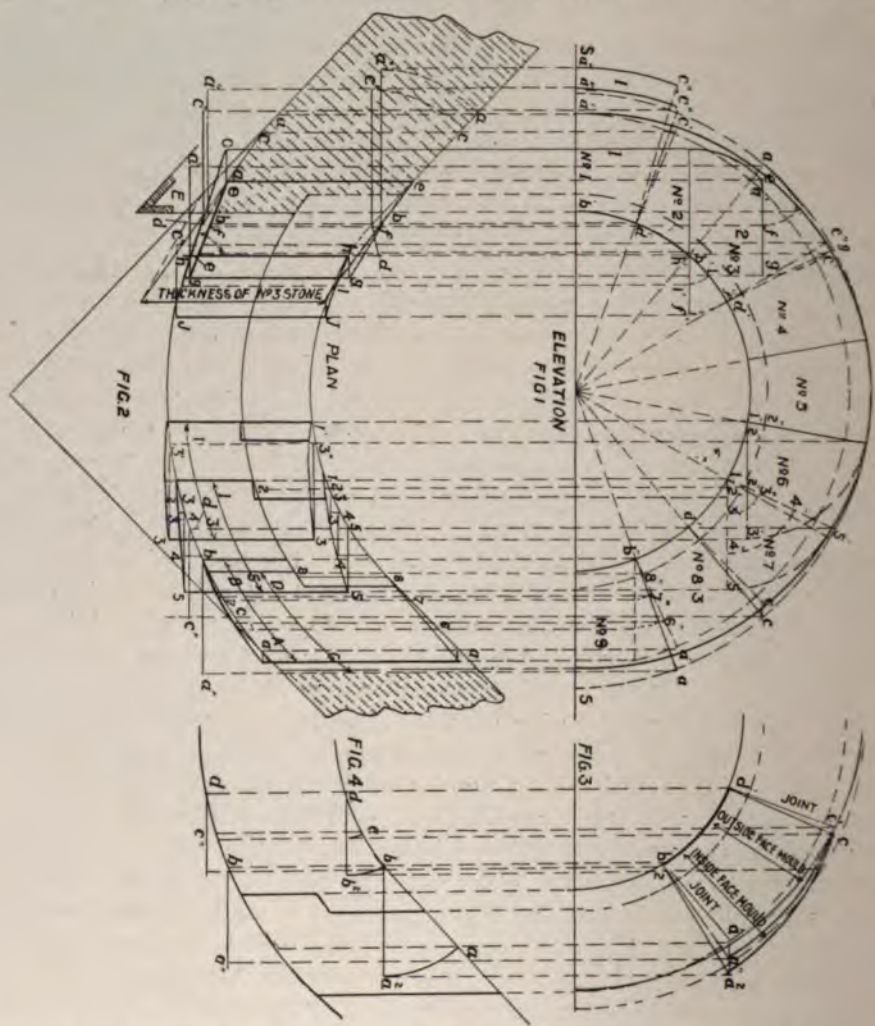
The lime contained 99.80 per cent. of calcium oxide.

Wm. C. Day.

CIRCLE ON CIRCLE ARCH.

THE accompanying drawing illustrates a method of obtaining the general moulds to a scale ¾″=1′. First is drawn the sight line or intrados of the elevation, which is a semi-circle, next a preliminary line for the extrado, a portion still remains as a dotted line. Then divide the extrados into the required number of voussoirs and draw horizontal lines through each point of division; those lines will be the height of the voussoirs whatever the finished elevation may be. Now draw the required plan, making the bed-joint of the first stone in the springing line equal to the depth of the crown, which is *a a* on left of plan, and complete as shown, then erect lines from *a*, and the rebate line in plan to springing line in elevation, continuing *a* until it cuts the horizontal line drawn through the point of division on the back of the arch, and continue the elevation of rebate by a dotted line as indicated. The elevation of joints, when the arch is complete, will be *a′*, *b′*, *c*. *d* for each stone. To obtain the face moulds, commencing with No. 1 in elevation, drop perpendiculars from the points *a′*, *b′*, *c′*, *d′*, cutting the plan in *a*, *b*, *c*, *d* on the outside of curve. From the points *b* and *c* draw lines parallel with springing line. Now obtain the stretch out on the plan of *a b* and *c d*, and set the distances of the lines *a*° *b* and *c*° *d*. From *a*° *c*° erect perpendiculars into elevation at *a′ c″*, join *a″* to *b*, and *c″* to *d*, and complete the mould 1. For a clearer explanation see Figs. 3 and 4. Proceed in a similar manner to obtain the remainder, No. 1, 1 being the outside and inside moulds. The bevels for the first and third stone are shown at E and F. E will require no explanation, as the elevation of the joint on which it is applied is horizontal. Taking F for No. 3 stone, covered by No. 2 face mould, revolve the joint *a′*, *b′*, as shown at *o′*, *b′*, from *o′* drop a perpendicular and continue it beyond the outer curve of plan, and from where *a′* cuts the outer curve of plan in *a*, draw a parallel with springing line intersecting *o′* in *o*, join *o* to *h*, which is the plan of the revolving point *b′*. Then the angle, *o h h*, will contain the required bevel F. To obtain the soffit and back moulds, take No. 3 stone again, fold the back and the soffit horizontal, as shown by *e′*, *f′*, *g′*, and *h′*, *i″*, *J′*, then let fall lines from *e′*, *f″*, *g″*, and *h′ i″ J″*, in elevation passing through the plan at *e*, *b*, *h*, also let fall perpendiculars from *f′ g′* and *i″ J′*, intersecting parallels drawn from *b*, *h*, *i*, *J*, in *f g* and *i J*. The back mould being inclosed by the lines *e e*, *e g*, *g g*, *g e*, the soffit mould by the lines *h h*, *h j*, *j j*, *j h*. The bed moulds for stones 6 and 8 are therein laid down in plan 1 3 and 1 5 for

No. 6, and the joint $a'\ b'$ of No. 8 by C D. To obtain the moulds divide the joint in elevation into any number of parts, and from the points of division (as 1′, 2″, 3″, 4″, 5″) let fall perpendiculars, cutting curve of plan in and out at 1, 2, 3, 4, 5: from 1, 2, 3, 4, 5 draw lines parallel with springing line and intersecting perpendiculars from 1′, 2′, 3′, 4′, 5′; draw the curve in and



out through the points of intersection and the required mould is obtained. The principle involved in this solution is one in elementary solid geometry, viz., the plan and elevation of a line given, to find the true length, with the addition of a geometrical fact that all points revolving travel in a pathway perpendicular to the line of revolution.—*Illustrated Carpenter and Builders.*

[Regular Correspondence STONE.]

NOTES FROM ABERDEEN.

To the Editor of STONE:

DEAR SIR:—Last week, with a comparatively small quantity of gunpowder for charge, a blast at Sclattie quarry, about five miles from this city, was successful in dislodging an enormous quantity of granite. One Brobdignagian block measured 30 feet by 30 feet by from 12 to 15 feet, and weighed over 1,000 tons. There is no tackle in this neighborhood to lift Titanic masses of this size, and the rock was therefore split, it being found that the block was solid and sound light-gray granite all through. No larger block of granite, it is believed, has ever been quarried in Scotland.

Granite quarrying generally is unprecedentedly busy in this quarter, and quarry-masters have succeeded in obtaining a rise of five per cent. for building stones. A large new quarry is to be opened about fourteen miles to the west of Aberdeen.

Arrangements have been made for the municipalization of the whole tramway system in this city. The town council will pay for the tramway company's undertaking £15 per share (£10 fully paid) and take over the mortgage obligations, which will represent an additional bonus of about 5 per cent. to the stockholders. Should Parliament give its sanction, the tramways will belong to and be worked by the municipal corporation from and after July 1. If the standing orders are held not to be complied with, the actual transfer may not be till next year. In any case there will be large extensions, and the granite paving work will form a considerable item.

The Great North of Scotland Railway Company has given statutory notice to include the circular railway in Aberdeen as part of their bill for running powers to Inverness, the capital of the Scottish Highlands.

Offers amounting altogether to over £10,000 have been accepted for building the Empire Palace Theatre, Aberdeen, to replace the People's Palace Music Hall destroyed by fire. The exterior will be of local granite, and there will be some very fine internal decoration in marble.

Aberdeen Parish Council are to erect a fine office in Union Terrace, adjoining the office now being built for Aberdeen School Board. The most beautiful granite buildings in Britain are located in and near Union Terrace, which has the additional attraction of the Union Terrace public gardens all along the east side.

The site for the new chief post office here has not yet been settled by the Postmaster General. Other local public schemes at present not disposed of are (1) A scheme to extend the wholesale fish market at a cost of £15,000 for buildings and £7,000 for wharf. (2) An extension of the bathing station at the sea beach, at a cost of £5,000.

Nine competitive designs have been lodged by local architects for the the new central fire engine station in Aberdeen.

The monumental trade in this city is now fairly busy. Orders for cemetery monuments are not perhaps quite so numerous as could be wished, but those for polished and ornamental fronts for buildings are satisfactory to the trade.

The operative slaters in Aberdeen have been on strike since the 31st of December last, but the "bosses" having come forward to-day (Monday) and granted concessions, work will be resumed on Wednesday morning. The dispute arose over a question of by-laws, and an increase in wages will commence in June, the amount not yet being settled.

HEATHERBLOW.

Aberdeen, Scotland, March 8, 1897.

*INSTRUCTION IN ARCHITECTURAL DRAWING.—V.

VII.—THE ORDERS.

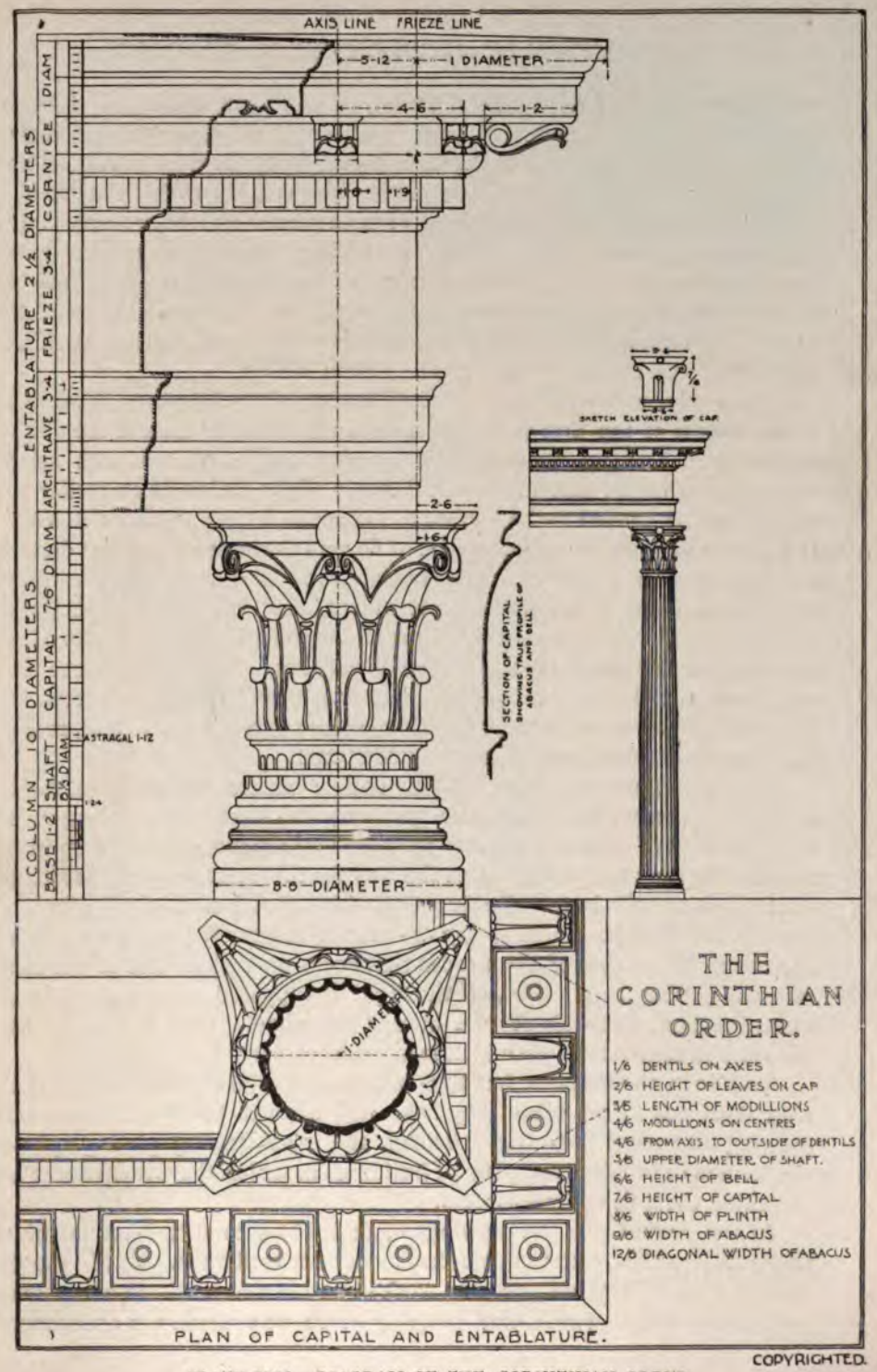
N all this work the objects drawn are mainly of an architectural character. Even the purely geometrical figures are the elements out of which architectural details are composed; the vases, foliage and flowers are either themselves examples of architectural ornament, or are the originals which have suggested it; and the same may be said even of the studies in sculpture and the human figure.

These exercises, including, as they do, the drawings made in connection with the study of history, make the men fairly familiar with most of the more common architectural forms. But there is a certain class of architectural details which, not only from their unique position, both in the history and in the practice of the art, but also from their intrinsic quality, require a closer study. The Greek and Roman columns and entablatures, and the forms of doors, windows and other features, which in earlier or later times have been devised to accompany them, are at once the final fruit of all the Egyptian and Oriental art that comes before them and the source and inspiration of all the mediæval and modern architecture that has followed. They form, moreover, at the present day, the habitual medium of architectural expression in every civilized country.

To learn to employ the Orders in architectural compositions is a part of the study of design. But the study of these elements of design themselves is a branch of architectural drawing and comes properly within the subject of this paper. The experiments and criticisms, the variations and selections, of two thousand years, while they have evolved a great number of species, so to speak, of this genus, have, as in the natural world, determined the limits of profitable variation in each within narrow bounds, so that it is possible to define what may be called their normal types with something of geometrical and even of arithmetrical precision. With these types it is necessary that the architectural student should become perfectly familiar, so that he may employ them in his thinking and in his drawing with as little hesitation as he employs his multiplication table, or the vocabulary of daily conversation.

The task proves, happily, on investigation, to be less formidable than might be thought. Their very universality makes these forms familiar to the eye, and it is almost as easy to learn how they go as to learn a popular

*Original in *School of Mines Quarterly*. Revised copy furnished STONE by author.



COPYRIGHTED.

PLATE XXI.—DIAGRAM OF THE CORINTHIAN ORDER.

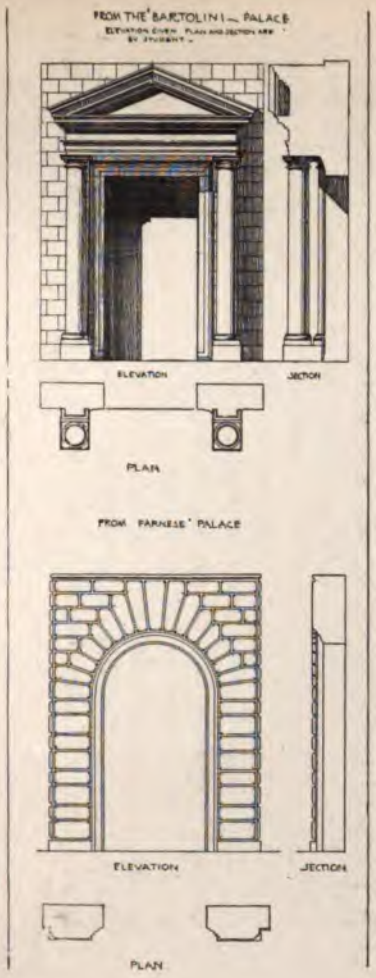
tune. Their quantitative determination, so as to get them just right, is more difficult, and is rendered particularly so by the cumbrous systems of modules and minutes which the text-books, from the time of Alberti and Vignola, have employed. A little study, however, shows that the use of a scale of parts, which are according to Vignola twenty-fourths or thirty-sixths of a diameter, and according to other authorities sixtieths, is quite unnecessary. It is perfectly practicable to define all the dimensions which it is important to define at all, in terms of the sixth part of a diameter, for all the Orders. The diagrams which illustrate these results are made accessible to the students by means of *blue-prints*. (Plate XXI.)

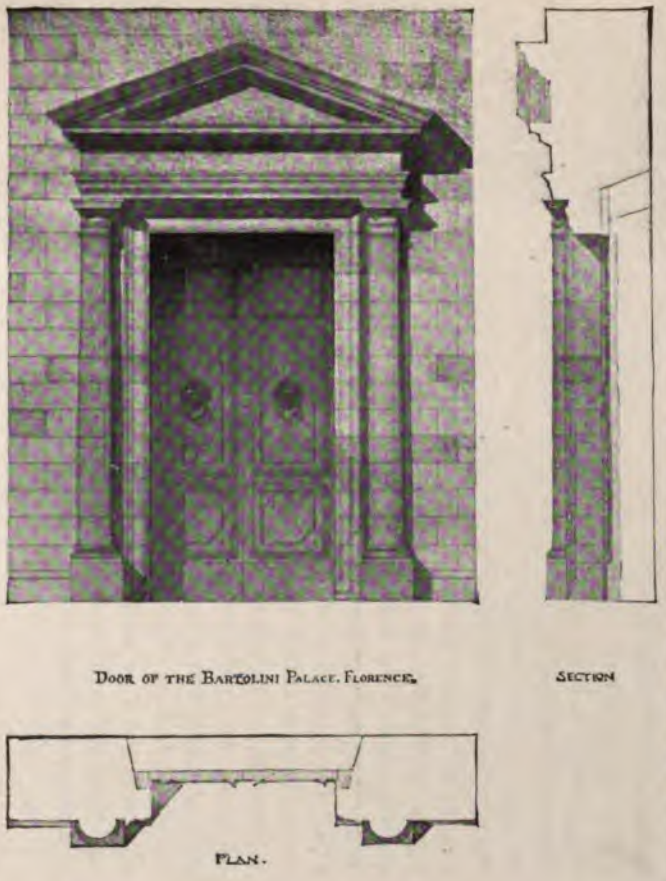
This study, under the name of the Elements of Architecture, is taken up in the middle of the first year, and is expanded so as to include the discussion of such features as staircases, arcades, vaults, domes and spires. Formerly we began this arithmetical study of the Orders at an earlier moment. But it proved to be a mistake to approach the subject on this side. It was like making the acquaintance of flowers through a botanical dictionary instead of in a garden. The students, we found, were prone to regard these masterpieces of art, not as graceful and beautiful, but as containing so many sixths. We now, as has been said, begin with them as works of art, drawing and sketching them for their own sakes. By the time these rules are given out the capitals and cornices have become familiar objects, and statistical information in regard to them comes as a felt want, and, satisfying a legitimate curiosity, is easily remembered.

Meantime the study of projections and of shades and shadows, which, along with perspective, descriptive geometry and stereotomy, belong rather to the subject of graphics than to architectural drawing, is taken up in the first half of the year, and prepares the way for this more scientific treatment of the Orders. It is accordingly practicable to teach not only the forms of these details and the simplest way of drawing them out, but, as has already been said, the shapes of the shades that occur upon them and of the shadows which they cast. For, as the light is supposed always to fall in the same direction, these shapes are always the same. This is a great help toward a draughtsmanship which is at once scholarly and rapid.

To clinch the nail that has thus been driven, and to make sure that the men shall not forget what they have just learned, the work in free-hand drawing is turned into this channel, the class taking photographs or engravings of buildings or parts of buildings in which the Orders occur and sketching them in various aspects.

In the second year the drawings made in the second term are mainly in illustration of the historical studies, modern or mediæval. But in the first term the time is given partly to work in design and partly to a systematic preparation for it which may properly count as exercises in architectural





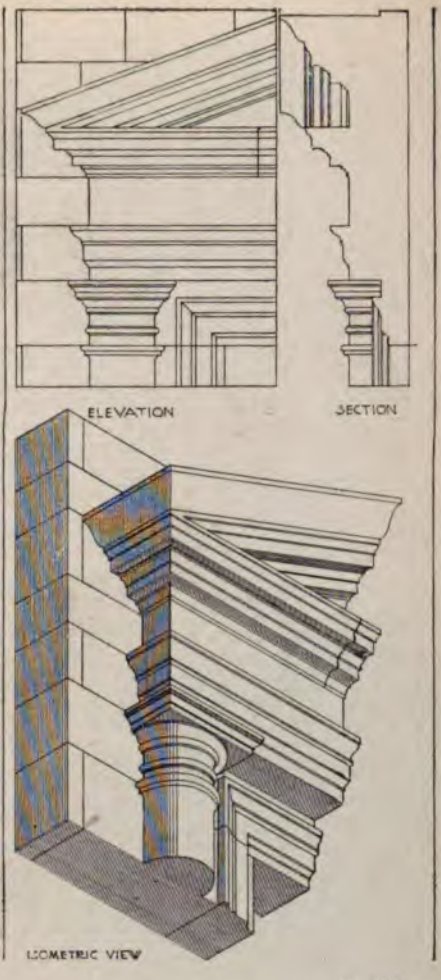


PLATE XXII.—STUDIES OF DOORWAYS. (Second Year.)

H. McL.

draughtsmanship. To pass at once from the study of the Orders to problems in the designing of buildings, has proved too long a step for men to take without more constant personal supervision than we can offer. For the last two years these disciplinary studies have accordingly been introduced, and the drawing of doors, windows, pavilions, external and internal wall treatment, etc., is prepared for by a detailed study of each of these features in plan, section and elevation. (Plate XXII.) This is equally serviceable for the study that it immediately leads to, for the problems in the designing of structures that begin in the third year, and for the historical studies and the work in historical design which in both the second and third years occupy the chief part of the spring.

In all this work of tracing and copying, of reasoned construction, of interpretation, inference, and imaginative creation, the special needs of a school of architecture justify a special procedure. It is the distinction and privilege of the student of architecture that his work from the very beginning is controlled by the same considerations which are ultimately to govern him in the larger fields of architectural composition. For the elementary forms which enter into the composition of building are themselves of man's device, embodying and illustrating all the fundamental principles of the art. While the painter and the sculptor, who work with natural forms, have to defer the study of composition, which is in all the arts the ultimate artistic endeavor, until a sufficient knowledge of natural forms and skill in the representation of them have been acquired, the student of architecture may practice his inventive and creative faculties from the outset. It is the aim of the exercises described in this paper, accordingly, to train these faculties, and in so doing to develop the imagination, to encourage independent thinking, and to promote not only a working familiarity with the accepted historical forms and the geometrical elements that enter into them, but an intelligent understanding of them in all their relations. *Prof. Wm. R. Ware.*

[THE END.]

SILICA IN STONE.

NOTWITHSTANDING all the discoveries and improvements which have been made in chemical science, we are still unacquainted with the means of dissolving silica in water or other fluid, so as to imitate nature, or to show how silicious earth is produced in the animal, vegetable and mineral kingdoms. The presence of silica, completely in solution, may be detected in various mineral springs, especially if they are naturally hot or tepid. The geysers, or boiling fountains in Iceland, contain nine or ten grains of silica in every hundred cubic inches of water, from whence solid silicious matter is copiously deposited about the mouth of each fountain. A small quantity of silica is also to be met with in the hair, horns and feathers

of animals; and it is secreted in larger quantities on the wings or hard shiny external casing of the numerous tribes of beetles. It is likewise deposited abundantly round the outside of cane, bamboo, straw and all the larger kinds of grasses. These facts are constantly operating in the beautiful laboratory of nature, but they, like many others, are inexplicable with our present knowledge. The elementary substances which form either chert, flint, quartz or sandstone are produced perfectly in solution, but we are ignorant of the means; neither can we discover, by any of the ordinary processes of nature, a mode of dissolving the individual grains which compose silicious rocks, their decomposition being usually effected by disintegration, or separation of the grains from each other by mechanical forces, assisted by some chemical agency.—*The Architect, (London).*

UNITED STATES ENGINEERS AS BUILDERS.

IT is an interesting fact that the National Library Building (Washington, D. C.), which is by far the most beautiful public edifice in America, and is considered one of the finest if not the finest modern structure in the world, cost less than any building ever erected by the government of the United States in proportion to its size. It cost a little more than $6,000,000, of which $1,000,000 was spent in decorations, paintings, frescoes, carvings, bronze doors, stained glass, marble and bronze statuary, mosaic work, etc., which were not necessary, but were simply intended for ornament. Notwithstanding this fact, the entire cost of the building was only 60 cents per cubic foot, while the cost of the State, War and Navy Departments, which was the last great building previously erected in Washington, was $1.10 per cubic foot; the City Hall in Philadelphia $1.56 per cubic foot, and the Capitol at Albany $1.80 per cubic foot. If the ornamentation of the new Library had been omitted, the cost of the building would have been only about 50 cents per cubic foot—less than any other public structure in the country. The plans were produced by competition. The contracts for the entire building were made in a lump, instead of annually, as is usually the case with government work. The lowest bids as a rule were not accepted, but the awards were left to the discretion of the superintendent of construction, who sought to obtain the best results, without considering economy alone. Gen. Thomas L. Casey, of the engineer corps, was superintendent as long as he lived, and was succeeded by Capt. Bernard G. Green. These two officers erected the Washington monument.—*American Contractor.*

"Inclosed please find $2,00 for STONE for 1897. We are very much pleased with STONE, and think it is all right."—*Bras D'Or Marble Co., Marble Mountain, C. B.*

ROOFING SLATE IN IRELAND.

FROM the recent reports of United States consuls at Belfast and Dublin, we extract the following information concerning the roofing slate trade in Ireland. The consul at Dublin writes:

A firm in the United States has addressed to this office a series of questions regarding the uses of slate in this consular district, their purpose being to increase their export trade. In accordance with consular regulations, I make the report to the Department of State. The questions propounded are:

1. Is slate produced in Ireland? If so, to what extent, and how manufactured and used?

2. If no slate is found, is any used, and in what form? From what country is it exported?

3. In your judgment, is there a market for American roofing slates, blackboard, or school slates in Ireland?

Slate is chiefly employed in Ireland for roofing purposes and for mantelpieces. There is a quarry in this district, at Killaloe, County Limerick, Ireland. The chief products of this quarry are roofing slates. It supplies chiefly Limerick and the adjacent district. I am told that this quarry produces a slate of good quality at prices cheaper than current for Welsh slates, but despite this fact the Killaloe slates have never commanded the Dublin market to any extent. The reasons assigned for this by the architects, who really control the trade, are that the supply is not regular. The quality of the Killaloe slates makes it preferable to Welsh slates, as I understand, for mantelpieces. From the best information I have been able to obtain, the Irish slate supply must be regarded of good quality, but the quantity offered is too limited and irregular to be of much commercial importance.

Dublin is chiefly supplied with slates from Wales, the quantity used in Dublin being probably something like 11,000 tons annually. Of this supply, about seven-eighths is brought from the Bangor district and the remainder is chiefly from the Carnarvon district. As would appear later, it would seem that slates from Westmoreland district are coming into favor with Dublin architects. The principal sizes imported are known as "queens," and are 24 by 14 inches. Prices in Dublin, which twelve months ago ruled at $20 per ton for Welsh slates, have now advanced to about $27.50 per ton, an advance of 37½ per cent. The trade is in the hands of merchants who retail to the builders. However, I understand that the trade is very largely

controlled by the architects, who, under the system prevailing here, determine the quality and the kind of material to be used.

From what I can gather from the architects, there does not seem to be a prejudice against American slates *per se*. Welsh slates are criticised by them as being cold in color and inartistic. If American slates could compete in prices and quality, while at the same time offering warmer colors, I do not see why they should not command at least a share of this market, provided they were properly placed before the trade.

School slates have never commanded an extensive market in Ireland, and the trade is a diminishing one. Inquiries directed to two of the houses in Dublin engaged in this trade elicited the following replies. One says:

The slates principally used in Ireland come from Wales. We stock also German and American slates, but the demand is very slow. Slates, in our opinion, are rapidly giving place to paper, upon which most schools do their work. * * * Slate or silicate blackboards we do not keep, as our customers, as a rule, use blackboards made of wood.

The other house says:

We find the trade in slates a decreasing one. Jotters and squibblers are produced so cheaply now that they are taking the place of slates. They are a much more satisfactory stock to handle.

I addressed to a few of the leading architects of Dublin the following questions:

1. Why is the Welsh slate preferred to Irish or American?
2. Is the preference one of price or of quality?
3. Is there anything in the Dublin climate which renders the Welsh slates better adapted for use here?
4. If architects have a preference for Welsh slates; state the points of preference.

I append replies received from two of the most eminent architects in Dublin. One says:

The reason that Welsh slates are preferred to Irish is that their quality is decidedly superior, while the difference in price is slight. I do not recollect to have ever used American slate on any of my buildings, so that I am unable to speak from experience of their quality. The opinion I have formed from conversing with men qualified to judge is, that the Eureka green slate, with which the roofs of Christ Church Cathedral are covered, is of excellent quality, but too costly for general use. On the other hand, I am told that some very inferior green slates have been shipped from America, which have a tendency to discolor and disintegrate in this climate. I do not know their cost but I presume they are cheap. I have not noticed any of them being used here for some years past, however.

In my opinion, Welsh, Irish, Scotch, and Westmoreland slates, as well as tiles, are unaffected by the Dublin climate.

Speaking for myself, my main object is to obtain the best value in the materials I use in my building slates or otherwise. In the next place, quality and price being equal, I would give a preference to native materials. I have no reason to doubt that this is a general feeling among Dublin architects on the subject.

Welsh slates are in favor because (generally speaking) their price is moderate and their quality good. They are open to two objections, viz., that they are made too thin and their color is cold and inartistic. The green Westmoreland slate is both for quality and appearance the best slate that comes into Dublin, so far as I know, but its price renders its use impossible in the ordinary run of business.

The architect in the foregoing has pointed out one of the defects commonly alleged in American exports, that is, quality. Here is a case where one of the great cathedrals of Dublin was roofed with an American slate of high quality which gave satisfaction and has continued to give satisfaction, but the chief trouble was its price, which forbade its general use. Immediately a cheap and inferior slate, resembling the other only in color, was put upon the Dublin market, and the result was to bring American slate into ill repute. If exporters would see to it that only goods of qualities in accord with representations were exported, the effect upon our foreign trade would be magical.

The other architect writes as follows:

The Welsh slates have obtained nearly universal use heretofore in Dublin, simply because being a water-bourne building material from the neighboring and convenient coast, no other, subject to the greater cost and risk of breakage incident to land carriage, could hope to compete with them in price. This is also true of stone, bricks, and other building materials on the east coast of Ireland for eight hundred years. Except common native stone for rubble, it will be found that nearly all the building materials in this district are more readily, cheaply, and systematically delivered by sea carriage than they could be obtained from native source.

Welsh slates cannot be said at this present time to be preferred by architects at least. The market price has been pushed to an excessive limit. The slates (first quality) are now split so thin in the quarries as to scarcely bear handling, fixing, or any weight to speak of. The color of Welsh slate is not generally pleasing to architects in England or Ireland. Now that comparative prices do not rule the choice, architects prefer the heavy, strong, and pleasant-colored, gray-green slates of Westmoreland.

As weather slates, the Welsh slates have had no superior in standing Dublin climate. Irish slates, so far as they have come into the Dublin market and been tested by intelligent builders, are found to be excellent weather slates, but less uniform than Welsh slates in quality and have been irregular in delivery. Splendid slates from Victoria quarries, once in the market, but not now, were suitable for building cisterns. Mantelpieces in Killaloe slates are good and would be preferred by most architects to Welsh slates. The quarries do not give a steady or reliable supply. They are smothered by accumulations of waste and debris. They are not developed with sufficient system, capital, or under the same facilities as the Welsh quarries.

Dublin climate is particularly trying to wood, stone, and slates. American slates heretofore tried have not suited it. There was a large importation of them about twenty years ago, and they "caught on" by their pleasing color and low price. They have not stood well, and are altogether out of repute and use now.

The same gentleman, in a letter to me, says:

You may take it from me that there is a fortune for some man who will produce an artificial slate. It must be less fragible than natural slate or tiles. It must be thick and rough in texture and weather enduring.

The folly of the present Welsh quarry manipulators is in producing a thin, smooth, nice article. Close lapping with these is the worst of weather roofing—draws wet by capillary attraction and breaks under frost. The artificial slate of the future must be as thick and rough as an ordinary Westmoreland slate and not too light.

From the above, our slate exporters can form a fair idea of the quality which would meet the approval of the Dublin architects, who in the final are the arbiters in the slate trade.

The consul at Belfast writes:

During the past twelve months several communications have been received at this consulate from quarrymen in the United States, requesting information concerning the prices of, and demand for, roofing slates; also, what qualities and from what countries were the slates most desired, etc.

The answers were not as complete as desired because of the difficulty hedging such information, but recently some additional data has been gathered which may be of value to home quarrymen seeking a foreign market. Just at present the conditions seem very favorable for an entering wedge for American slates, more especially as there is a protracted strike on hand at the Port Penrhyn quarries.

First, it should be known that this city has at present in the neighborhood of 60,000 houses of all descriptions, and, with few exceptions, they are all roofed with slates. Within the year just ended there were 2,917 buildings erected, an increase of 621 over 1895. Furthermore, by a recent act of Parliament the city boundaries have been increased 11,000 acres, and if the city's prosperity and growth continues in the same ratio as at present, which is extremely probable, the number of structures erected will be proportionately larger. As 99 per cent. are roofed with slates, and as the smallest house requires at least a ton of 2,240 pounds, it is not too much to say that last year's consumption in Belfast and vicinity must have exceeded 10,000 or 12,000 tons.

Until very recently all roofing slates came from the quarries in Wales, and even now but a very small portion of them come from anywhere else. Owing, however, to the scarcity and high prices of the Welsh article, there is some inquiry for American slates, notwithstanding that they are alleged to be inferior to the Welsh slates.

This scarcity and increase in price began after the great storm of Dec. 11, 1894, when so many buildings were unroofed all over the kingdom, and especially in this city. Since then the output of the Welsh quarries seems to be inadequate to the increasing demand, and the Welsh firms have advanced their prices from 30 to 40 per cent., and their independence is such as to display no fear of dangerous competition.

As a result of the inquiry for American slates, one firm has imported three lots of seventy tons each within the year. Messrs. W. F. Redmond

& Co., of Newry, large slate importers, state that they readily disposed of 1,500 tons of American slates during the year just closed. The subjoined letter from this firm contains information of practical importance to our quarrymen:

James B. Taney, Esq., American Consulate, Belfast—DEAR SIR: In reply to your favor of the 23d of December, the high prices charged for slates by merchants last year was not due to the advanced prices of the Welsh slate quarry owners, but to the scarcity of stocks held by local merchants in Great Britain and Ireland, combined with a general improvement in the building trade, and consequently increased demand, and also to the severe winter of two years ago, which reduced the outputs of all the Welsh quarries.

The qualities of Bangors principally imported into Ireland are first quality green and wrinkled. Bangor slates are purple blue and not the color of American Bangor and other slates imported from the Slatington district, Pennsylvania, which are similar in color to Oakely and other Portmadoc slates, and therefore where Bangor or similar color slates must be used, American slates cannot be sold.

We consider American slates of unfailing color to be equal to Portmadoc slates (Oakely or others) "medium quality," but slightly heavier, and it is in competition with these slates and not Bangors that we have sold what we imported; but if we and others could get what we required from Portmadoc and other Welsh ports, we should not import American slate which cost more than the Welsh slates here though in point of quality we consider them equal to medium Portmadocs, though heavier.

Owing to advantageous contracts, and to the fact that we were appointed sole Irish agents for the American quarries for whom we sold, we had no difficulty in disposing of the 1,500 tons which we imported, and also because we were careful not to import more than the market would bear, but once the supply of Welsh slates again becomes equal to the demand the importation of American slates must cease.

Some twenty years ago American slates were imported, which faded out almost white; this has, unfortunately, greatly prejudiced buyers against them, and until this prejudice is removed and Americans have proved the unfading qualities claimed for them, they will not sell against Welsh slates, unless at a much lower price or under such circumstances as those of last year. Yours truly, W. F. REDMOND & CO.

Newry, Dec. 29, 1896.

It will be observed that Messrs. Redmond & Co. assert in their letter that "once the supply of Welsh slates becomes equal to the demand the importation of American slates must cease." Messrs. Redmond & Co. unquestionably believe the above, but a large local builder and contractor, whose name I am not at liberty to disclose, informed me that he did not see why the American quarrymen do not make a greater effort to get a foothold in this market. He admitted that there was a prejudice against American slates, arising out of some dear experience several years ago when considerable quantities of American slates were imported. The cause alleged was that the color (green) changed to a whitish hue after a short exposure. Then the demand ceased entirely. But the prejudice will vanish if prices and quality are satisfactory and color guaranteed. The Welsh slates, he continued, have a great advantage over any newcomer because of their well-

known qualities and durable colors, smoothness, suitable thickness, etc. On the other hand, there are high prices, scarcity, and independence of Welsh quarrymen, all of which make the conditions favorable for the American slates capturing a fair share of the market.

For the information of American firms the particulars, terms, and prices, reduced to United States currency, of the Bangor and Festiniog, North Wales, slates for the year 1896 (which are practically the same as the lists just issued for 1897), are herewith appended. There are one or more lists of other Bangor quarries which are not at hand, but which I am informed are governed by the Penrhyn prices, and therefore are always the same as the Penrhyn slates.

PRICES AND PARTICULARS PER TON OF 2,240 POUNDS OF PENRHYN SLATES, PORT PENRHYN, BANGOR, NORTH WALES.

SORTS AND SIZES.	Green and wrinkled.	Gray.	Blue.	Red.
Queens, first quality:				
24 inches long, various breadths	.....	.....	$18.60	$18 60
24 26, 28, and 30 inches long, without specifying quantities of each	.....	.....	17 99	17.99
32, 34, and 36 inches long, without specifying quantities of each	.....	.....	17 51	17.51
Ton slates, first quality:				
12 by 6	$7.78	$7.78	8 51	8.51
11 by 7	7.78	7.78	8.51	8.51
10 by 8	7 78	7.78	8 51	8,51

On and after Jan. 1, 1896, a premium of 5 per cent. will be charged on all invoices (slabs excepted).

Sizes.	First quality tally slates					Second quality tally slates.				
	Computed weight per 1,200	Price per 1,200 slates				Computed weight per 1,200	Price per 1,200 slates.			
		Blue	Red	Gray	Green and wrinkled		Blue	Red	Gray	Green and wrinkled
	Cwts					*Cwts*				
24 by 14	65	$63.26	$63.26	$60 09	$60 09	90	$59.36	$59 36	$62 04	$53.53
24 by 12	56	57 42	57 42	54.50	54.50	78	55.72	55.72	58 63	49.87
22 by 12	51	47 92	47 92	45 49	45.49	68	45.98	45.98	49.14	41 60
22 by 11	47	43 06	43 06	41 12	41 12	62	41 85	41 85	43.59	37.22
20 by 12	47	42 82	42.82	40.87	40.87	62	40.39	40 39	42 59	36.00
20 by 10	36	41.60	41 60	39.66	39.66	50	36.49	36.49	36.49	33.08
18 by 12	39	36.00	36.00	35 52	35.52	56	33.57	33.57	34.54	29.92
18 by 10	33	34.06	34.06	32.84	32.84	45	26.52	26.52	28.46	24.81
18 by 9	29	29.19	29.19	27 98	27.98	42	22.13	22.13	24 33	20.43
16 by 12	34	31.62	31.62	30.89	30.89	48	24.33	24.33	26.03	22.13
16 by 10	28	27 98	27.98	27.00	27.00	40	22.86	22.86	24.08	19.21
16 by 9	26	24.37	24 37	23 59	23.50	37	18.48	18.48	20.67	16.53
16 by 8	23	21 16	21 16	20.43	20.40	33	17.51	17.51	18.72	15.07
14 by 12	31	23.59	23.59	22.86	22.86	42	19.46	19.46	21.89	17.02
14 by 10	26	21.65	21.65	20.92	20.92	34	17.02	17.02	18.72	14.83
14 by 8	21	16.78	16 78	16 05	16 05	27	13.13	13.13	15.56	12.16
13 by 10	23	18 72	18 72	17 75	17.75	31	14.59	14.59	16.78	12.89
13 by 7	16	12.16	12.16	11 43	11 43	21	9.97	9.97	11.67	8.75
12 by 10	21	15.32	15.32	14.59	14.59	29	12.40	12.40	14.35	10.94
12 by 8	18	12 40	12.40	11 67	11 67	22	10.21	10.21	11 67	8.75

Loading expenses on slates.—By rail, 30 cents per ton; by vessel, 24 cents per ton.

As an allowance of 1 cwt. over in every ton, or 60 slates over in every thousand, is made at the time of the delivery of the slates on the wharf for loading, to cover the ordinary breakage, and as the purchaser never pays for any excess he may receive beyond the quantity invoiced, viz., 1,200 slates to the thousand, or 20 cwts. to the ton, no abatement or further allowance can be made for any deficiency from breakage, short delivery, or other cause. The purchaser takes his chance whether he receives any surplus above 1,200 slates to the thousand, or 20 cwts. to the ton, or otherwise.

Customers are particularly requested to order slates according to the denomination in this list and to mention which quality and color, if any error occurs from ordering; otherwise the loss will fall on the purchaser.

PENRHYN SLATE SLABS BEST QUALITY.

	Per ton.
Lotted slabs, sawn all round and split as near the thickness required as possible and of promiscuous dimensions, as under, viz :	
Lot 1—½ inch, ¾ inch, 1 inch, 1¼ inches, 1½ inches thick, between 3 feet 6 inches and 7 feet long and 2 feet 6 inches and upwards wide	$14.59
Lot 2—1 inch, 1¼ inches, 1½ inches, 2 inches, 2½ inches thick, between 6 feet and 9 feet long and 3 feet and upwards wide	18 24
Billiard slabs, best quality, self-faced, sawn and split to order	17.98
Slabs, best quality, self-faced, sawn and split to order	21.89
Slabs, best quality, to order, planed on one side (including hearthstones)	23.11
Slabs, best quality, to order, planed on both sides (including hearthstones)	24.33
Brewery slabs, best quality, planed on both sides, of promiscuous dimensions, viz., 6 feet and upwards long and 2 feet 6 inches and upwards wide:	
1 inch thick	22.38
1¼ inches thick	21.40
1½ inches thick	20.92
2 inches and upwards	19.94
Skirtings to order, between 3 feet and 8 feet long and from 4 inches to 8 inches wide, and not less than half an inch thick	17.02

PENRHYN SLATE SLABS, SECOND QUALITY, PLANED ON BOTH SIDES.

Lot 1—From 3 feet and upwards long, 2 feet and upwards wide, and from 1½ inches upwards thick, without specifying sizes or thicknesses	11.67
Lot 2—Of specified thickness, but not less than one inch	14.11
Lot 3—Slabs, sawn and planed on both sides to order of specified sizes and thicknesses, but not less than 1 inch:	
Not exceeding 5 feet 6 inches long or 2 feet 9 inches wide	18 24
Upwards of 5 feet 6 inches long or 2 feet 9 inches wide	20.67
Billiard slabs, second quality, planed on both sides and sawn to order	25 54

In ordering lot 1, second quality, it is only necessary to mention the weight; for lot 2, the weight and thickness; and for lot 3, the weight, dimensions, and thickness required.

About 150 superficial feet of 1-inch thick slabs are computed to weigh a ton.

Loading expenses.—By rail, 30 cents per ton; by vessel, 24 cents per ton.

Terms of payment.—If reference is satisfactory, cash or bank order not exceeding seven days' date, payable in London, and free of any charge for commission or stamp, to be remitted within one week from date of invoice, net cash. If required, cash to be remitted before the slates are forwarded.

Loading expenses.—Per rail, 30 cents per ton; per vessel, 24 cents per ton.

Hexagon, gothic, diamond, round or other fancy slates made to order at 5 per cent additional to above prices in first quality only; medium quality, as above, $19.46, and upwards; second quality, as above, $16.41, and upwards.

Terms.—All slates are loaded at the purchaser's risk, with an allowance for breakage of 60 slates per thousand of 1,200, and 1 cwt. per ton when sold by weight.

All orders are entered subject to output and to prices and terms at time of shipment.

No credit will be given on any quantity less than 50 tons at a time, except to customers who are in the habit of keeping larger accounts on the books.

If requested, insurance of the cargo will be effected through a broker and charged in the invoice.

Accounts payable by approved acceptances on London at three months from date of invoice, or monthly accounts, less 2½ per cent. cash discount.

Prices and particulars of machine-dressed blue slates from the Oakeley Slate Quarries Company, Limited, Blaenau-Festiniog, shipped at Portmadoc, North Wales

Names	First quality			Medium quality		Second quality.			Allowing 3-inch lap, will cover about—
	Sizes	Computed weight	Price per 1,200	Computed weight.	Price per 1,200.	Sizes	Computed weight.	Price per 1,200.	
	Inches	*t c qr.*		*t c qr.*		*Inches.*	*t c qr.*		*Sq. yards.*
Empresses	26 by 16	4 0 0	$83.70	4 0 0	$76.64				170
Small empresses	26 by 15	3 15 0	77 86	3 15 0	72 90				160
Princesses	24 by 14	3 5 0	70.56	3 5 0	62.04	24 by 14	4 0 0	$52.91	136
Duchesses	24 by 12	2 15 0	60.82	2 15 0	57.18	24 by 12	3 10 0	45.61	116
Small duchesses	22 by 12	2 10 0	54.13	2 10 0	47 44	22 by 12	3 5 0	38.93	105
Marchionesses	22 by 11	2 5 0	49.26	2 5 0	43.79	22 by 11	3 0 0	37.10	97
Countesses	20 by 10	1 15 0	42.58	1 15 0	39.53	20 by 10	2 7 2	31 62	78
Wide viscountesses	18 by 10	1 12 2	34.06	1 12 2	32.25	18 by 10	2 2 2	25.54	69
Viscountesses	18 by 9	1 7 2	31.62	1 7 2	29.19	18 by 9	1 17 2	21 89	62
Wide ladies	16 by 10	1 7 2	29.79	1 7 2	27.98	16 by 10	1 17 2	21 89	60
Broad ladies	16 by 9	1 5 0	26.15	1 5 0	24.33	16 by 9	1 12 2	19.46	52
Dames	16½ by 8½	1 5 0	26.15	1 5 0	24.33	16½ by 8½	1 12 2	19.46	52
Ladies	16 by 8	1 2 2	23.81	1 2 2	20.67	16 by 8	1 10 0	16.41	48
Wide headers	14 by 12	1 10 0	26.76	1 10 0	23.81	14 by 12	1 17 2	21.28	60
Headers	14 by 10	1 5 0	24.33	1 5 0	21.28	14 by 10	1 15 0	17 63	50
Small headers	13 by 10	1 2 2	20.67	1 2 2	18.24	13 by 10	1 7 2	15 19	46
Small ladies	14 by 8	1 0 0	19.46	1 0 0	15.80	14 by 8	1 5 0	12.16	40
Narrow ladies	14 by 7	0 17 2	16.81	0 17 2	13.38	14 by 7	1 2 2	10.94	36
Doubles	13 by 7	0 15 0	14.00	0 15 0	12 16	13 by 7	1 0 0	9.73	32
Wide doubles	12 by 8	0 17 2	14.00	0 17 2	12 16	12 by 8	1 0 0	9.73	32
Small doubles	12 by 6	0 14 0	8.51	0 14 0	7 29				25
Singles	10 by 8	0 15 0	8.99	0 15 0	7 90				26
Fractions	11 by 5½	0 12 2	5.46	0 12 2	4.25	14 by 9	1 15 0	13.98	20
Units	10 by 6	0 12 2	5.46	0 12 2	4.25				20
Odds	10 by 5	0 10 0	4.25	0 10 0	3.04				16

American quarrymen seeking to place their slates on this market can judge from the foregoing what prices and terms are necessary to compete with Welsh slates.

The sizes preferred are 24 by 14, 24 by 12, 22 by 12, 22 by 11, 20 by 12, 20 by 10, 18 by 12, 18 by 10, 16 by 10, and 16 by 8.

Light weight slates should do four squares to the ton of 2,240 pounds.

The most popular weights will do from three to three and a-half squares per ton. The gauge used is generally 4-inch lap. This is a builder's statement; but it will be observed that the Oakely Slate Quarries Company only allow a 3-inch lap in the calculations as to the number of square yards their respective sizes will cover.

Slate should be smooth and even. Color is not an absolute essentiality, although important, but durability of color is. The most salable colors are best blue or bluish purple.

For the purpose of negotiating business, the principal importers of roofing slates in this locality are: W. F. Redmond & Co., Newry, County Down; Thomas Dixon & Sons, 105 Corporation street, Belfast; J. P. Corry & Co., 33 Garmoyle street, Belfast; William Gabbey, 1 Hope street, Belfast; W. D. Henderson & Son, 55 Waring street, Belfast; Gregg & Co., Green street, Belfast; Robb Bros., 109 Corporation street, Belfast; Kirker Robb & Co., 99 Whitla street, Belfast.

THE DINGLEY TARIFF BILL.

THE proposed revised schedule of rates under the "Stones" section are as follows:

MARBLE, STONE AND MANUFACTURES OF.

112—Marble or onyx, in blocks, rough or squared only, and not dressed or made into articles, 65 cents per cubic foot; marble of all kinds, and oynx, sawed or dressed, including marble or onyx slabs, paving tiles or mosaic cubes, containing less than 4 cubic inches each, $1.10 cubic foot; but in measurement no slab, tile or cube shall be computed at less than 1 inch in thickness.

113—Manufactures of agate, alabaster, chalcedony, chrysolite, carnelian, garnet, jasper, jet, malachite, marble, onyx or rock-crystal, including clock cases with or without movements, not otherwise specially provided for in this act, 50 per cent.

114—Burrestones, manufactured or bound up into millstones, 15 per cent.

115—Freestone, granite, sandstone, limestone and other building and monumental stone, except marble and onyx, unmanufactured or undressed, not specially provided for in this act, 10 cents cubic foot.

116—Freestone, granite, sandstone, limestone, and other building and

monumental stone, except marble and onyx, not specially provided for in his act, thewn, dressed or published, 40 per cent.

117—Grindstones, finished or unfinished, $1.75 ton.

MEDIÆVAL MASSACHUSETTS LEGISLATORS.

A CURIOSITY in legislation is exhibited in the bill relative to stone to be used for building purposes. The bill in its original form came in early in the session with the petition of John E. Baldwin, a Democratic representative from the fourteenth (Suffolk) district. The bill is a short one and can therefore be given in full:

"No stone which was cut, dressed or hammered outside of the limits of this Commonwealth shall be used for building purposes in this Commonwealth. Any person who uses any stone for building purposes in violation of this act shall be fined not more than $500 and not less than $50 for each offense."

Here we have an instance of protection in which it is not foreign countries that are discriminated against, but in which it is our sister states that are shut out from competition. They have their octroi duties in France, but this is going a step farther. This bill does not propose to levy a duty upon stone cut elsewhere, but it shuts out such stone altogether and makes it a misdemeanor for any one in this state to use such stone. If a builder desires a different variety of granite from what we have here, he must send to Thomaston, Me., Concord, N. H., or Westerly, R. I., or for the stone in the rough, and unless it is cut, dressed and hammered in Massachusetts it cannot be used. The same relative to Portland (Conn.) stone, marble, sandstone, limestone, freestone, etc. This is one of those labor measures which are all the time coming forward and which do more harm to the workingmen, for whose benefit they are supposed to be drawn, than they do to anybody else. It is a pity, by the way, that the bill could not have been reported with an amendment providing that all stone imported into the state should be used in the building of a wall around it, so that in process of time we should be utterly excluded from the rest of the United States and the rest of the world.

But the committee on labor, in its alleged wisdom, saw fit to alter the bill in such a manner that it is now distinctly different in letter and spirit from what it was before, as witness:

"No stone which was quarried, cut, dressed or hammered by convict labor shall be used for building purposes in this Commonwealth. Any person who uses any stone for purposes in violation of this act shall be fined not less than $500 for each offense."

Here we have a bill which is aimed against prison labor, in the state as

well as outside of it; and therefore the bill, as we regard it, is entirely foreign to the petition upon which the original bill was founded, namely, "for legislation prohibiting the use in this Commonwealth of dressed or hammered stone which was dressed or hammered outside of this Commonwealth." We shall expect to see this bill ruled out as not in order, for the reason we have just stated, and so the matter will end. But it is lamentable that we have men in the general court who feel called upon to propose such exclusive legislation, and lamentable also that a committee should have no better understanding of law-making than to utterly change the character of the bill, even though they thought that the inhuman warfare that is just now waging against prison labor might serve to carry it through.—*Transcript, Boston, Mass.*

RETAIL MONUMENT DEALERS OF ILLINOIS.

THE retail dealers in granite and marble throughout the state of Illinois met in Peoria March 17, and decided to organize the Marble and Granite Dealers' Association of Illinois, the object of which shall be the general improvement and elevation of the trade in all its departments; the promotion of friendly relations and intercourse and protection of purchasers from impositions practiced by illigitemate and irresponsible dealers and salesmen.

The meeting was called to order at 10 o'clock a. m. at the Hotel Fey by R. J. Haight, of Chicago. He was unanimously chosen temporary chairman and Charles Richter, temporary secretary. It was at once decided to effect an organization and that matter was left to a committee consisting of Henry Triebel, Peoria; Louis Zinger, Pekin, and C. S. Richter, Springfield. John H. Merkle, Peoria; John A. Brown, Decatur; M. H. Meaney, Jacksonville; H. Grindoll, Decatur, and H. J. Higgins, of Bloomington were appointed a committee on constitution.

A banquet was tendered the visitors. The election of officiers resulted as follows:

President, John H. Merkle, Peoria; secretary and treasurer, M. H. Meany, Jacksonville; vice-president of northern district, Louis Zinger, Pekin; vice-president central district, W. H. Grindoll, Decatur; vice-president southern district, Hon. W. H. Lathrop, Newton; executive committee, H. J. Higgins, Bloomington; H. G. Triebel, Peoria; C. S. Richter, Springfield.

The next meeting will be held in Springfield upon the third Wednesday in June next.

*GEOLOGY FOR QUARRYMEN—IV.

DEVELOPMENT OF FISSILITY IN HETEROGENEOUS ROCKS.

IN the development of fissility in heterogeneous rock beds the directions of the forces are exactly the same as with cleavage, but as fissility develops along the shearing planes, in the simplest case this structure forms in two general directions. In simple folding, as there is differential movement between the layers, the deformation of a portion of a given layer is that of a rectangle (Fig. 129, *abcd*) into a parallelogram (Fig. 130, *efgh*). If the layer were exactly homogeneous and the pressure normal, the secondary structures would be nearly at right angles to each other and at an angle of about 45° to the greatest pressure. According to Becker, in the case of inclined pressure the structures would have different positions, but they still would be planes. These conditions are most nearly approached in the center of a bed which at this place is massive. However, in passing from the center to the weaker, outer part, the original bedding may largely control the direction of parting, the partings occurring near the planes of bedding rather than those of greatest tangential stress (Fig. 131). The result is that the planes of fissility may change from their diagonal position in the center of the layer, where it is most rigid, to nearly parallel to the bedding on the outer parts, where it is least rigid.

The diagonal *ad* (Fig. 129) is shortened to *eh* (Fig. 130); therefore the fissility along the diagonal *gf* is formed under conditions of compression. This results in producing many approximately parallel planes of fissility. No sooner does a parting form than the laminæ are sheared over one another, thus producing slickensided surfaces. Across this structure along the longer diagonal, in the plane of the shorter diagonal, there is actual stretching of the layers. The length of the original diagonal *cb* is increased to *gf*. Parallel cracks are therefore produced in this direction. As a crack once formed easily widens, the result is the production of a few cracks of considerable size. The broken parts do not rub over one another, and hence do not produce slickensided surfaces. These peculiarities frequently lead to oversight of the shearing along the planes of the shorter diagonal. The development of the cracks along the shorter diagonal are strictly analogous to the upward-pointing crevasses of a glacier.

*Reprinted from Sixteenth Annual Report U. S. Geological Survey.

The planes of fissility near the border of the beds, where the rigidity is less, perhaps originally developed diagonally, may be rotated to a nearly parallel position. This rotation may change the direction of the planes of fissility either in the compressed or the stretched diagonal. The cross fissility will grade into parallel fissility by a gentle curve. On opposite sides of a layer the curves are in opposite directions, just as in the case of cleavage, and by these curves it is easy to determine the relative direction of movement of the layers (Fig. 131).

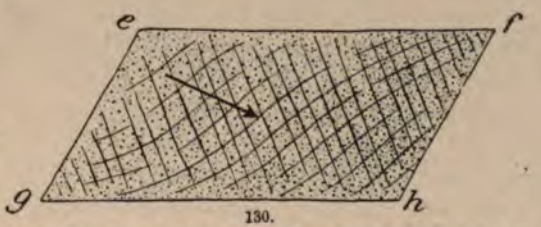
This rotation is explained by Fig. 132, which is supposed to represent a bed of rock made up of thirteen layers differing in rigidity. In passing from the outside of the bed to the center the coefficient of rigidity of each layer is supposed to be twice as great as that of the one next adjacent. The greatest stress is supposed to be the same throughout the bed; and in an inclined direction, and these conditions may be approximately complied with upon the limbs of folds. When the differential stress exceeds the ultimate strength of the rock, parallel fractures along shearing planes will be formed. The fracturing will continue until the stress falls below the ultimate strength of the rock. The differential stress may still surpass the elastic limit of the rock, or if not, it may again accumulate until the elastic limit is exceeded. Flowage will then begin. On account of the varying rigidity the two layers adjacent to the center will have a certain amonnt of differential movement, which may be called 1. The layers next to them toward the outside will have a movement which would be represented by 2; those next to them, 4; those next to them, 8; and the outside layers a movement of 16. Now, connecting similar points in the different layers, a curve is produced which corresponds very nearly in form to those which have been observed in nature. The structure produced in the diagonal direction, in the centers of the layers, has been rotated to the position indicated. In different rocks the variation of the coefficient of rigidity would be different from that supposed, and it would undoubtedly vary irregularly instead of regularly. A more accurate discussion would consider each of the layers as indefinitely thin, and the coefficient of rigidity in passing toward the center of the bed as increasing by a minute increment. If different numerical suppositions be made, curves would be produced differing from those represented by the figure, but the same in essential character.

A third way in which the curved fissility above described may be produced is as a structure secondary to cleavage. Such previously developed cleavage would give parallel curved surfaces of weakness. When the rock passed into the zone of fracture fissility would develop along these shearing planes whether they were those of maximum tangential stress or not.

It is possible that in the cases of both cleavage and fissility as the folding becomes closer and closer the zones of much shearing may extend far-

ther and farther into the rigid beds, producing secondary structures nearly parallel to bedding throughout the limbs of the folds. If the thrust be so powerful as to give the layers isoclinal dips, the secondary structures and bedding will be developed or rotated so as to be nearly parallel throughout the rock mass, except at the sharp turns on the crests of the anticlines and in the troughs of the synclines, just as in the case of normal plastic flow in homogeneous rocks.

129.



130.

FIGS. 129 and 130.—Diagrams showing development of fissility along the longer and shorter diagonals of a deformed portion of a rock stratum
In the center of stratum the fractures are in the planes of greatest sh-aring, but on the outside of the layer the fractures are in lesser shearing planes, the direction of fracture being controlled to some extent by bedding.

FISSILITY SECONDARY TO CLEAVAGE.

For any given layer in a horizontal position in the zone in which fissility is developed, it is probable that horizontal thrust is great in proportion to gravity. If gravity were wholly neglected the greatest shearing stress would be at 45°, to the bedding. In the zone in which cleavage is developed it is probable that gravity is very important as compared with tangential thrust. If these are supposed to be equal, the direction of greatest normal pressure would be inclined at 45° to the bedding, and the cleavage planes at right angles to this would also be equally inclined to the bedding, but in an opposite direction. It therefore follows that fissility developing in heterogeneous rocks in the shearing planes and cleavage developing in rocks of the same character in normal planes may have like directions with reference to the bedding. If cleavage be developed in the normal planes inclined to the bedding, and by denudation this stratum passes to the zone of fracture, as a consequence of the lessening power of gravity, these normal planes are now shearing planes, and fissility is controlled in direction

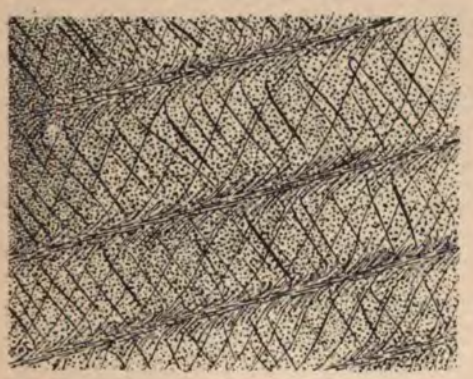


FIG. 131.—Parallel and cross fissility in heterogeneous rock strata.

by the previous cleavage structure: It thus becomes evident that it may be exceedingly difficult, if not impossible, to discriminate between original fissility in the shearing planes and a secondary fissility which has been controlled by cleavage. In other cases, as well as these special ones, it is to be expected that a rock in which cleavage has developed under deep seated conditions would be ruptured before reaching the surface during the long time it is in the zone of fracture. To this expectation the facts correspond. In all regions with which I am acquainted having well-developed cleavage, fissility is also found to a greater or lesser degree. Usually the fissility is more marked here and less marked there, for where a fracture or set of fractures has been formed, there it is easier for further movement to occur. Hence belts of strongly fissile rock are separated by others in which there is but slight fissility. In general, however, fractures along shearing planes occur near together or wide apart within all rock masses showing cleavage. To this the confusion of the two structures is doubtless largely due. It may be that the use of the term "fissility" should be restricted to a structure developing secondary to cleavage or to bedding, and that original fractures, developing along shearing planes, independent of any previous structure, should be called joints. However this may be, it appears probable that where a rock is broken into very thin laminæ in a uniform direction for a considerable area, the secondary structure originally developed as true cleavage in the normal planes. I therefore conclude that fissility developing in the shearing planes is usually secondary to cleavage which developed in the normal planes.

Fig. 132.—Diagram showing rotation of cleavage which originally developed in the normal planes to a position nearly parellel to bedding

CLEAVAGE AND FISSILITY MAY DEVELOP AT THE SAME DEPTH.

It is clear that in heterogeneous rocks cleavage and fissility may develop in beds of different character at the same depth, for weak beds may be in the zone of flowage at the same depth at which strong beds are in the zone of fracture. For instance, the fine-grained argillaceous beds within a formation may develop cleavage, while the coarser-grained siliceous beds may develop fissility. Thus may be explained some of the cases of change in direction of the secondary structures in passing from one to the other. Also, a bed under a certain weight may be in the zone of fracture if rapidly deformed, and in the zone of flowage if slowly deformed. It is only in the zone of fracture that fissility alone can form, and only in the deep-seated zone of flowage that cleavage alone can form.

Charles Richard Van Hise.

[TO BE CONTINUED.]

OUR FOREIGN TRADE IN STONES, ETC.

From the summary statement of the finance, commerce and immigration of the United States, corrected to March 6, 1897, we compile the following:

ARTICLES.	JANUARY.				7 MONTHS ENDING JANUARY—			
	1896		1897		1896		1897	
Imports—	Quan.	Values.	Quan.	Values.	Quan.	values.	Quan.	Values.
Cement, Rom., Portland imp. from (lbs.)		*Dollars*		*Dollars*		*Dollars*		*Dollars.*
United Kingdom	30,397,533	91,674	4,220,952	13,655	225,175,888	707,067	143,919,659	467,068
Belgium	22,335,532	66,457	6,950,285	18,169	174,379,162	522,440	165,895 167	484,834
France	6,032,453	15,222	.....	.....	12,382,991	34,211	8,727,561	24,172
Germany	23,658,666	81,067	21,047,066	70,179	332,655,420	1,109,695	276,612,838	913,265
Other Europe	1,527,666	3,655	1,198,438	7,375	37,480,944	138,594	7,714,645	28,825
British North America	75,000	410	4,200	18	2,696,761	12,380	2,102,300	8,368
Other countries	.....	.....	.....	.....	.....	.....	804,100	3,871
Total	84,026,850	258,485	33,420,941	109,396	784,771,166	2,524,387	605,776,270	1,930,403
Marble, and mfrs. of	.....	89,207	.....	42,935	.....	535,118	.....	384,927
Stone, & manufactures of, including slate	.....	20,221	.....	13,479	.....	245,819	.....	210,866
Total	.....	109,428	.....	56,414	.....	780,937	.....	595,793
Exports—								
Marble and stone, and manufactures of:								
Unmanufactured	.....	7,158	.....	2,992	.....	46,593	.....	40,409
Manufactures of—								
Roofing slate	.....	26,648	.....	49,710	.....	93,527	.....	365,362
All other	.....	49,063	.....	45,023	.....	407,148	.....	336,041
Total	.....	82,869	.....	97,725	.....	547,268	.....	741,712
Cement.....bbls	.....	.....	3,657	6,396	.....	.....	18,224	33,415
Exports foreign mdse.								
Cement, Rom., Portland & other hydraulic...lbs	481,622	1,959	156,270	544	2,880,108	11,149	1,977,072	6,890
Marble, & mfrs. of	.....	16	.....	414	.....	1,342	.....	3,550
Stone, & mfrs. of including slate	.....	76	.....	910	.....	4,576	.....	6,821
Total	481,622	2,045	156,270	1,868	2,880,108	17,067	1,977,072	17,261

Merchandise Remaining in Warehouse on January 31, 1896 and 1897, Respectively.

ARTICLES.	December 31—			
	1895.		1896.	
	Quantities.	Values.	Quantities.	Values.
Cement, Roman, Portland, etc.....lbs...	9,490,782	$ 26,322	11,801,979	$ 33,536
Marble and stone, and manufactures of:				
Marble, and manufactures of	.....	79,141	.....	19,748
Stone, and manufactures of, including slate	.....	.....	.....	360
Total	9,490,782	105,463	11,801,979	53,644

THE confusion of names in an item in our last issue referring to the organization of a company to develop a marble property near Great Barrington, Mass., makes us say it was the "Goodale" quarry that had been abandoned by a former company as valueless, when that reference should have been made to the "Goodsell" quarry. The Goodale property, or, as it is somewhat known, the Hall estate, is the property which is to be developed by the company recently incorporated. It is described as a deposit of exceedingly fine marble, and the new company is well fixed financially and otherwise to exploit it successfully.

The Middleman. Wholesale dealers in granite, or, more clearly, the concerns that stand between the producer and manufacturer of granite monuments and the retail dealers, have noted our argument of instruction to the latter that they would conserve their best interests by dealing direct with the former, and some of them have courteously inquired "What have we wholesalers done to merit so much rebuking at your hands?" (meaning our pen-in-hand) while others have brazenly offered us a direct bribe of advertising patronage if we would cease comment. To the first we have replied denying rebuking them, unless they consider honest advice to retailers to stop dividing the legitimate profits on their orders with them, as such. As for the second, the fact that their advertisements do not appear in STONE indicates what our answer was to them.

We could not offer anything more conclusive of the correctness of our position on this subject than the incidents referred to. Except as importers, we are not able to see that the wholesale monument dealer is indispensable. The producer and manufacturer quarries and constructs the work that the retailer is in business to buy, hence why should the latter place his orders with the wholesaler who gets the goods from the same source? If it involves the matter of credit of the retailer, of promptness in delivery, of security of shipments, of better selection of material, of designing, of possible protection in selling to his trade, and the wholesaler is the most competent to secure for the retailer all he demands under these, or other agreements, why, then, STONE would cheerfully cease its advice and comment, and admonish the retail dealer to conduct his business of ordering monuments from the wholesaler. But so far our advices are exactly contrary to the advantages of such a system. We have several dozen letters from prominent retailers (STONE is not largely read by any other kind), commending the position we have taken, and not one disputing the points offered. We have taken this response to confirm our opinion that the subject is a timely one, and ought to be broadly discussed.

The manufacturers and wholesalers, as a matter of fact, are not on the best of terms with each other, nor are the retailers and wholesalers, taking them in a general view, hence the system is wrong, since it does not work mutually satisfactory. We believe the wholesaler, in connection with his trade as an importer, might conduct the business of wholesaling monuments under a satisfactory arrangement with the manufacturer to handle his entire product, but while the manufacturer continues to solicit the direct trade of the retailer, in competition with the wholesaler, some one or two of the three "merchants" involved in such

dealings is bound to get the worst of it. While such a system continues there will be unrest, complaint and loss to credit to it. The remedy is to dispense with the least essential agency in the transaction. As matters stand the man in the middle is the one who should step aside. If not, why not?

Retail Dealers' Combines. The recent organization of the monument dealers of Illinois for protective purposes, serves to call up the monumental failures of similar organizations in other states. From our observation of these associations, we are convinced that they have not concentrated effort to removing the irregular methods of trading, so much as they have attempted to punish dealers who have practiced them, and practiced them, very likely, as a matter of self-preservation. It is customs that require removal—not the dealer that needs disciplining. He is simply in the habit because he cannot survive without indulging it.

But the necessity for something to prevent the destruction of trade and profit has become so strong that dealers who feared a loss of individual influence, have become convinced that the cure lies in combination and can be secured in no other way. It is clear that the volume of a trade is but little influenced by a condition of destructive cheapness. It rather is an outcome of the prosperity of the individual buyer and his want for the article to be sold. It is rare that a dealer can secure a sale merely because the article is cheap. The buyer must first want it. If he does not, mere cheapness will not tempt him. To be sure, if he does want an article, he searches for the cheapest bidder, and has been taught to go from one to another for the lowest prices, certain to find some one who, from ignorance or necessity, furnishes the article at a price that leaves him no profit, and has lowered the general level of profit by one notch. It should be so that when a buyer begins the search for cheapness, he should find the prices uniform. In such a case he will favor his local trader, or some one whom he considers will give him a superior article,and while this in exceptional cases might result in the loss of a sale, the general result would be nearly a level, and the year's sales would result as high in one case as in the other, with the difference that each sale would represent a profit and the year's business prosperity.

The remedy lies in the resolve of all dealers to deal with the quarry direct. If this were an established custom, the sales agent of the manufacturer would disappear; the wholesale commission dealer would find no business in sight, and the retail dealer's association would insure the local trade to the local dealer at good prices. What more does he want?

Tariff Reform. A circular letter issued March 27, by the Tariff Reform Committee, whose headquarters are in New York, reads in part as follows:

"The proposed (Dingley) tariff appears to be specially designed to help trusts and monopolies. It takes several dollars from the pockets of the people for every one that it turns into our national treasury. As a whole it confers even greater benefits upon privileged industries than did the McKinley bill itself. This partly because many duties are higher, and partly because the same duties are more prohibitive, *now that manufacturers have been compelled by lower duties to improve their machinery and methods to compete with foreign* man-

ufacturers. In many cases though increasing the burdens of taxation, it decreases the income from customs duties."

The italics are ours. By way of preface it may be stated that this Tariff Reform Committee is largely composed of importing merchants, attorneys for foreign corporations and politicians out of a job. We ask the attention of workingmen in the granite and marble trades particularly to the sentence italicized. Their greatest contention to-day is against the introduction of machinery in the manufacture of granite and marble, and they have insisted that this was because manufacturers seek this means to destroy their organizations. During the last national campaign their unions did all that was possible to do to aid this party of Tariff Reform by accepting its false issue of free coinage. Why these workingmen, who are directly affected by the competition in granite and marble, should have done this would indicate a blindness to self-interest that is most lamentable.

Verily, it is too true, that "lower duties" on granite and marble under the Wilson bill, did compel manufacturers to adopt means to hold their own against foreign competition, and these means involved the introduction of labor-saving machinery and "methods." It was a ground-hog case with most of them, and the cutters suffered from it. There is no "burden of taxation" on the American citizen who buys a granite monument, or a marble statue or staircase. These are things he is perfectly willing to be taxed for, because the "tax" is in the design rather than on the material, if he but knew it. He buys the foreign from no preference for a superior quality of material in it. The man with true American ideas, and a knowledge of the foreign and domestic materials, will always and intelligently select the home product. There is no "burden of taxation" on the American people so far as these foreign materials are concerned. We have no positive need for a cubic foot of either in this country, because our quarries produce what is superior to them for any use to which such materials are applied. This "tariff reform" plaint so far as granite and marble is concerned, has no bearing on the welfare of American citizens. The party of Protection has always held that the result of free foreign competition primarily meant the lowering of the wage scale of American workmen—either by the introduction of improved machinery, or by "methods" of rate-cutting, and here we have the Tariff Reform Committee conceding the point.

The workmen in the granite and marble industries should make a note of it.

Progress in Use of Stone. None can deny that the use of stone for other purposes than building is advancing broadly. And in building, notwithstanding the use of brick and terra cotta, there is no ground for disputing its advance. Cities are rapidly transforming from brick to stone, and even in small towns the stone front is common. This is bound to accelerate, and it presages an even greater advance of the stone industry than the past ten years have shown. Not only is this true of buildings and monuments, but an era of street and road-making is upon us, which is certain to enlarge the field of usefulness for stone, and to admit a more economical working of quarries, by utilizing the waste heretofore lost on the "dump." The industry may have its seasons of depression, along with all others, but from the nature of things this

can only be temporary, and there is scarcely an industry in the country that holds as certain and flattering prospects as the stone industry.

Capital and Labor. It is useless to disregard the human stomach. Its demands will override the law and the customs of a people. It is true also of capital. If too much capital is interested in a particular business, it is essential that either the capital will be increased or its *pro rata* of profit will be reduced. If the *pro rata* of profit is reduced, it means that the capital must be increased. But as the capital is increased, its profits must be reduced, unless, by common consent, a medium of profit is established that shall be unchangeable, as measured by the purchasing power of the dividend. But this is true, also, of labor, as the number of laborers are increased, the *pro rata* of division of profit is decreased, and the only recourse is to diminish the number of laborers, or to increase their profits. This means less hours or higher wages. It must mean that the potential of working force must not exceed the work to be done. It is easy to figure out that machine labor may in a measure be dispensed with, and that capital by its means may, in a measure, dispense with labor. But the human machine has a stomach, and certain social responsibilities that the metal machine has not, and it should be clear that human labor should not be entirely dispensed with, unless capital will endow labor with a share in its profits. It really means such an adjustment of work to do with power to do it as will admit all parties to the contract to live in a condition as prosperous as the product and its exchanges will admit. If we would say that a six per cent. dividend were enough for capital it must follow that all the other profits of labor and machinery will be taken by the laborer, and both of these depend upon equilibrium between the supply and demand. If the supply is too great a less output and less labor is required, and this means that workmen will work less, although by the aid of machines they may produce more. It also means that capital must earn less the more of it that is employed. Neither can grow unless the two are combined in the same relation of cutting the coat to fit the cloth. Or, if more of a line of goods are on the market than it can absorb, that less must be made, but at a higher cost. But a higher *cost* does not mean a higher price, because machinery has reduced the cost in the same ratio that prices are advanced. Or, to put this in a different way, as prices decrease the ability to produce increases, and the lower price is produced by enlarged production. But both the profits of capital and products of labor depend upon an equilibrium that neither can enforce without the other. Broadly, this means that the interests of labor and capital are identical, and we think that to this it will come in the end. They will both unite to solidify a steady dividend to capital and a steady income to labor. They are yet a good ways off, but they are gradually drawing nearer.

A Growing Habit. The fool who handles dynamite is coming into as much prominence as the fool who turns on the gas before lighting the fire. The habit of thawing out dynamite by placing it on a hot stove or boiler is a growing one. The certain thing about the dynamite fool business is that not enough is left of the "remains" of the foolish victim to hold a post-mortem over, so that science has not yet been able to determine whether it is the shock that kills, or whether he is simply blowed up and distributed into the atmosphere.

SELECTED MISCELLANY.

THE OLDEST ORGANIZED TRADE IN THE WORLD.

THE stone-cutting craft is the oldest organized trade in the world. It has been organized in some form as far back as recorded history. The craft is known in history as Masons. Out of their ancient unions sprang the oldest and best known secret society, known as Free and Accepted Masons. This ancient craft taught and practiced the principles of the eight-hour workday previous to the construction of Solomon's Temple. Eight hours for work, eight hours for sleep, and eight hours for recreation have always been, and are yet, the teachings of Masonry. The craft has had flourishing unions in many of the large towns and cities of this country for many years, some of them working the eight-hour day for over thirty years. The first national lapsed in 1879, but was reorganized in 1888. It has now 121 locals, most of which work the shorter workday. The International, like many of the older organizations, maintained wages and hours, and increased in both locals and membership during the late panic. Strike pay from six to seven dollars per week is paid, and a death benefit of $100. Internatienal dues are 25 cents per month.

A monthly craft journal is distributed free to each member.—*D. F. Kennedy.*

ANCIENT ROMAN TOMBS.

THE mausoleums of Augustus and Hadrian at Rome were structures of great magnitude and grandeur and resembled each other in being circular in plan. The first stood in the Campus Martius, where remains of it yet exist in the two concentric circles forming the first and second stories of the buildings and the vaulted chambers between, which supported the first or lowest terraces. Of these terraces there were three, consequently four stages in the building, gradually decreasing in diameter, the uppermost of which was crowned by a colossal statue of the emperor. The terraces themselves were planted with trees. From traces of something of the kind that yet remain it is conjectured that there was originally an advanced portico attached to the building in the same manner as that of the Pantheon, though considerably smaller in proportion to the rest of the plan, as it could not have been carried up higher than the first stage of the building. According to Hirt's representation of it in his "Baukunst bei den Alten," it was a Corinthian hexastyle, advanced one inter-column before the side walls connecting it with the circular edifice behind it. Hadrian's mausoleum, now converted into the Castello di St. Angelo, in which shape it is familiar to almost every one, is a work of massive construction, and originally presented an unbroken circular mass of building, erected upon a large square basement, lofty in itself, yet of moderate height in proportion to the superstructure, the latter being about twice as high as the former. This nearly solid rotunda, which was originally coated with white marble, had on its summit

numerous fine statues which were broken to pieces and the fragments hurled down by the soldiers of Belisarius upon the Goths, who attempted to take the building by storm. Neither are any remains now left of the uppermost stage of the edifice, which assumed the form of a circular peripteral temple, whose diameter was about one-third of the larger circle. According to tradition, its peristyle consisted of the twenty-four beautiful marble Corinthian columns which afterward decorated the basilica of San Paolo fuori le Mura (partially destroyed some few years ago by fire, but now nearly restored. Its tholus or dome was surmounted by a colossal pineapple in bronze now in the gardens of the Vatican.

FOOLISH CRITICISM OF THE RICH.

NOTHING is so easy as to divert the attention of a community like New York from a real issue to a fictitious one. Thus, at a moment when some hard-headed concentration on the gas question might have resulted in saving for the people of New York from five millions to ten millions of dollars a year on their light bills, a most excellent clergyman committed the inadvertence of expressing to his congregation his personal disapproval of ostentatious display and lavish expenditure as about to be exhibited in a certain fancy dress ball. Whereupon the newspapers of the town became wildly hysterical and began to print unnumbered columns of rubbish about this private entertainment. The irrepressibles of the pulpit seized the opportunity to launch volumes of sermons upon the ethical and economic aspects of luxurious expenditure; and the irrepressibles who had no other outlet wrote letters to the newspapers or offered themselves up to the interviewers. The entire discussion was without significance or practical bearing. Civilization is a very complex affair. So long as the laws of the land are not violated, the rich man's private expenditures are as strictly a matter to be controlled by his own taste and judgment as the expenditures of the poor man. Capital in this country, in our generation, has been eminently and conspicuously devoted to economic production, and has not to any appreciable extent been diverted and wasted in wanton luxury. It is none of the public's business how the millionaire monopolist spends his money; but it is in the highest degree the public's business how he has gained it—especially how it came to pass that he obtained the franchise or public privilege or other favorable opportunity by means of which he has enriched himself. A community that permits a monopoly to charge it a dollar and a quarter for gas, when if it had virtue and character it could make its own gas and supply itself at sixty cents a thousand feet, shows itself in a somewhat pitiable light when it affects to criticise rich people for giving fancy-dress balls or living in fine houses.—*From "The Progress of the World," in March Review of Reviews.*

CORROSION OF IRON IN STONE WORK.

THE corrosion which takes place on the bottom of iron railings set in stonework with melted lead is, according to Professor J. M. Thomson, of England, largely due to galvanic action, and the same action will exercise its influence in all cases where two different metals come in contact, unless that contact be as perfect as possible. But the action of acid vapors which are in the atmosphere of some towns on iron and zinc is considerable, especially when the metals are in the form of thin or perforated sheets and gauze. Professor Thompson observed the action of the air of Glasgow on a window-blind of fine iron wire-gauze during a period of about seven years. Although originally protected with lacquer, the lower portion of the blind in position opposite to where the window had been daily raised from its sash had been gradually eaten away. There is no doubt that such corrosive actions are assisted by the simultaneous process of oxidation, but there is, at the same time, evidence of the direct action of the acid vapors. The principal conditions under which lead fails are when it comes in contact with air, moisture and carbonic acid, more especially if organic acids derived from

the soil or other sources are also present. In this case rapid corrosion may be expected, the action being similar to that already mentioned in the formation of the basic carbonate or white lead. This action being continuous in the presence of the chemical substances mentioned, the lead becomes finally entirely converted. The rusting of gray cast-iron is apparently slower than that of wrought-iron, the different varieties corroding more quickly as the amount of carbon increases in the iron. A cement known under the name of "rust-jointed cement" is employed in the junction of iron pipes. It is composed of eighty parts fine iron filings, one part of ammonium chloride, and two parts of sulphur made into a paste with water. When this is packed into the joint it sets into a hard cement, apparently produced by the formation of mixed oxide and sulphide of iron.

PREHISTORIC STONE QUARRY OPENED.

PERSONS living in the vicinity of Export, Pa., are intently watching with a great degree of interest an extensive landslide on the William Duff farm. It is a vast body of clay and stone, embracing a mass of about three acres. The stone, or rock, is of a character employed for building purposes. The sight of this vast slide is a hillside of easy or gradual rise in a field that heretofore has been cultivated.

The first evidence of the slide became apparent last November. It was in the form of an almost straight break or parting in the rock extending downward to a great depth, estimated at 50 or more feet. Since that time the three-acre mass has been moving away from the hillside by slow degrees.

A strange feature of the side is that the rock, which appears to be broken in quarried blocks, has worked its way forward under the surface, so that the front part of the mass has been bulged up, and is now much higher than the rear part nearest the break-off. Within the past week the slide has moved forward perceptibly, making the great gap against the hillside a yawning chasm.

There are several other places on the same farm of similar appearance, but their origin has never been fully understood, as these chasms had an existence beyond the recollection of the earliest settlers. One of these chasms has the appearance of a huge stone quarry, from which hundreds of tons of rock had been removed. A tradition of the locality is that the quarry was operated by Indians long before the advent of the white man.

WONDERFUL THINGS THAT ARE NEAR.

THE Philadelphia *Press* foreshadows the coming of the millennium as follows:

Flying is solved. The principle is known. A mechanical expedient is all that is now needed to make it successful. Practical flight is to-day not more than five or ten years off.

A glow worm makes light with about one three-hundreth part of the force used in ordinary artificial light. When men know how to make light as cheap, streets and homes will be as light as day for a mere fraction of what light now costs. This is near. Vacuum illumination without incandescence is already in full operation, and in a year or two should cut down the price of light to a sixth of its current cost, and in five or ten years light may be, like water, turned on in every house at will.

Compressed air has long been known to be the best way, theoretically, to store force for use in transportation. There is no waste and no deterioration. The need is a cheap and efficient motor to apply compressed air to city transportation. If this can be done, first the trolley poles and wires will come down, next the horseless, compressed air motor carriage will do all the work of city delivery.

When these come the only use for gas will be for cooking—if this is not done by electricity. Factories, also, before many years, will be run by transmitted electric power. This has begun to be done and in five or ten years will be completed, and the factory fire and boiler will be a thing of the past.

The city of the future, and no very distant

future, will have no trolley poles or wires and no horses. All movements will be on rail by silent air motors or by horseless carriages equally silent. All pavements will be asphalt. Unlimited light will be as cheap as unlimited water to-day. No coal will be delivered at private houses and no ashes taken from them. With no horses, no coal and no ashes, street dust and dirt will be reduced to a minimum. With no factory fires and no kitchen or furnace fires, the air will be as pure in the city as in the country. Trees will have a chance; houses be warmed and lighted as easily and cheaply as they are now supplied with water.

A city will be a pretty nice place to live in when the first twenty years of the twentieth century are passsed.

VERD ANTIQUE MARBLE.

THE quarries from which the ancients obtained their highly prized Thessalian green marble have been discovered, and are again being worked by an English company. The quarries, which had been lost for more than 1,000 years are in the neighborhood of Larissa in Thessaly, Greece. The ancient workings are very extensive, there being no fewer than 10 quarries, each producing a somewhat different description of marble, proving, without a doubt, that every variety of this marble found in the ruined palaces and churches of Rome and Constantinople, and likewise in all the mosques and museums of the world, came originally from these old quarries. In fact, the very quarry from which the famous monoliths of St. Sophia, Constantinople, were obtained, can be identified with absolute certainty by the matrices from which they were extracted.

In modern times verd antico marble has only been obtainable by the destruction of some ancient work, and it has naturally commanded extraordinarily high prices. As a consequence, a number of ordinary modern greens of Greek, French, Italian and American origin have been deseribed, and sold as verde antico. No one, however, who is really acquainted with the distinctive character of the genuine material could be deceived by these inferior marbles. Thessalian green is easily distinguished from any other green marble by the following characteristics: it is a "breccia," of angular fragments of light and dark greens with pure statuary white, the whole being cemented together with a brighter green, while the snow-white patches usually have their edges tinted off, with a delicate fibrous green radiating to the center of the white. The cementing material is also of the same fibrous structure.—*Stonemason.*

FIND OF BLACK GRANITE.

A DISCOVERY of black granite has been made at the granite quarries at Bay View, Gloucester, Mass. This color is very desirable for ornamental purposes. A large bed has been found at Plum cove, on the land now owned by the Rockport Granite Works.

Some workmen, last fall, attempted to split up a large bowlder into paving blocks. They gave up the job, owing to the fact that the rock was so hard to work. A few weeks ago one of the officers of the company, while looking over the property, chanced to come across this bowlder. He took a small piece to the polishing mill, as a matter of curiosity, to see what kind of a polish it would take. To his surprise the result was a beautiful black green. Other portions of the polished rock were sent to leading architects in Boston, to get their opinion as to its desirability for ornamental, building and other purposes, and the replies, the officials state, were most encouraging.

The stone men say that they have excavated enough to satisfy them that they have an almost unlimited supply, and that the lower they dig the better the quality of the stone.

RECENT PATENTS.

PLANER FOR DRESSING STONE.

Patent No. 575,154, issued January 12, 1897, to Joseph Gilmour, of Brooklyn, N. Y.

This invention relates to that class of stone-dressing machines in which the block to be shaped is mounted upon a reciprocating bed or platen and subjected to the action of suitable cutting-tools held stationary relatively thereto. Here is devised a novel form of platen consisting of parallel sections mounted side by side and joined by removable keys. Each is provided with reciprocating mechanism, which when coupled together reciprocates the sections as a whole. On removing the keys and uncoupling the mechanism each section may be reciprocated independently, if desired.

Figure 1 is a plan view. Fig. 2 is a side elevation. Fig. 3 is an end view. Fig. 4 is a transverse vertical section through one of the keys and the adjacent edges of the platen-sections. Fig. 5 is a similar view taken at a right angle to Fig. 4. Fig. 6 is a longitudinal section of a portion. Fig. 7 is a transverse section of the same.

A A are the sections of cast-iron, rectangular in form, each equipped with slides A′ on its under face finished to match to the V-grooves in the ways B′, formed on the upper faces of the side frames B and carrying on its under face, near the mid-length, a nut A^2, tapped to receive the threads of a long screw *h* of quick pitch lying longitudinally of the section and serving to feed the latter as it is turned in the bearings B^2 B^2 at each end supporting the screw and holding it against endwise movement.

Two sections are shown in the illustrations, each the counterpart of the other, and similarly equipped. A description of one will suffice: The forward end of the screw-shaft carries a bevel-gear *d*, meshing into a corresponding gear *c* on a driving-shaft *b*, arranged at a right angle to the screw and lying in the same plane. It is supported at the outer end in a bracket B^3 and at the inner end in a forwardly-projecting portion B^4 of the framing. Power is communicated by open and cross belts (not shown) running on two sets of fast and loose pulleys *a* *a* and *a′* *a′*, the former being smaller and serving to run the platen back after a cut has been taken and the other larger to induce the slow and strong rearward movement against the tool. So far as yet described each section A is independent and may be operated by its own reciprocating mechanism wholly free from the motion of the other section. Thus conditioned work may be done on either or both sections the same as on two disconnected planers. The working of both sections as a single plate is as follows:

D D are notches or recesses formed in the adjacent edges of the sections A at equal distances from the ends of each, so that when the sections are side by side with their ends in line the notches will also coincide. They are preferably dovetailed in plan, as shown, and taper slightly vertically, being larger at the upper surface to correspond to the keys D′ D′, fitted thereto and adapted when driven home to lie flush with or a little below the upper surface of the sections and securely lock them together to serve as a single large platen reciprocated by the combined driving power applied to the pulleys *a* *a′* on the two shafts *b*. The latter are in the same axial line, the inner end of each overhanging within the space inclosed by the portion B^4 of the framing and carrying each a bevel-gear *e*, cut to mesh with a single bevel-gear *f*, arranged on a longitudinally-sliding shaft *f′*, mounted between the overhung ends of the shafts *b* in the bearings in the frame B^4. The bevel-gear *f* serves to transfer the motion from each shaft *b* to the other and cause both to revolve at the same rate of speed, thereby turning both screws *h* in equality and at a corresponding rate. The gear *f* is held in mesh by a swinging dog *g*, turning on a pin set in the framing, as shown, and engaging behind the boss of the gear. A similar dog *g′*, resting idly upon a collar f^2, serves by engaging between such collar and the framing to hold the gear out of mesh with the gears *e* *e* when it is desired to run the sections again independently, the dog *g* in that case riding idly upon the boss.

C C are connecting portions of the framing, joining the frames B B and aiding to stiffen the whole.

The advantages of the invention lie in the adaptability of the planer and the facility with which it can be conditioned for operating upon a large stone requiring the combined platen or for using each section independently for treating smaller blocks. In the latter case each section may move back and forth entirely free from the other, the length of travel in both directions varying in accordance with the length of cut required by the work being performed on each block, or one of the sections may be in use alone while the other is standing idle or is being made ready.

The tapering keys D′ form a simple, cheap, and effective joining means for the sections and are easily and quickly removed when required by driving from below.

It will be understood that all parts not particularly described, as the clamps, tool-holders, automatic belt-shifters, and other usual accessories (not shown), may be of any ordinary or approved construction and are omitted from this specification and drawings for brevity and clearness.

Modifications may be made within wide lim-

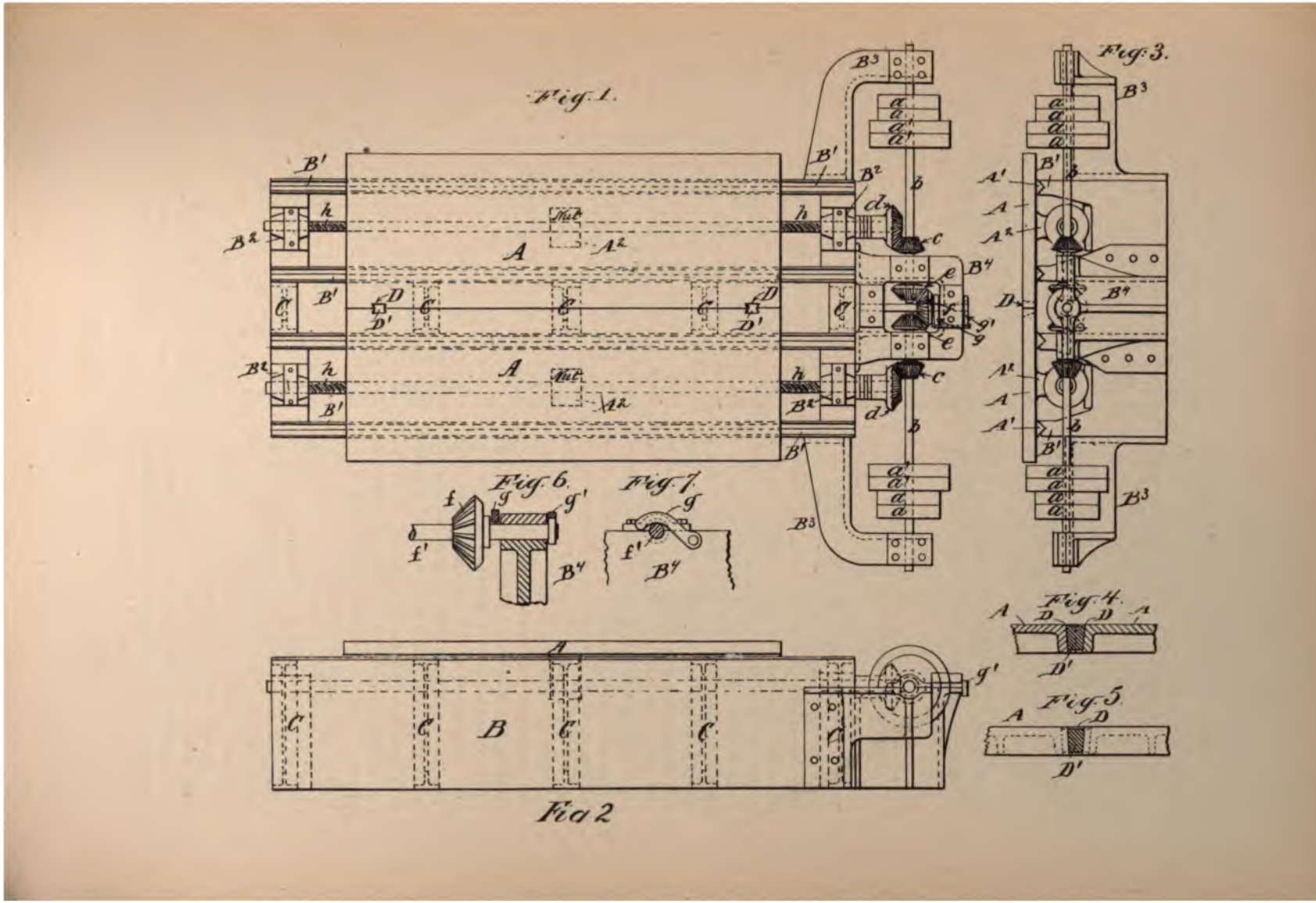


Fig. 1.
Fig. 3.
Fig. 6.
Fig. 7.
Fig. 4.
Fig. 5.
Fig 2

its without departing from the principle or sacrificing the advantages of the invention.

Other forms of keys may be substituted for those shown, correspondingly altering the shape of the notches, or other fastenings, as sliding bolts, may be employed.

The means described of coupling the shafts *b b* may be varied. Any of the ordinary forms of friction or other clutches adaptable to this purpose may be employed.

Although we have described the invention as applied to planers for dressing stone, it will be understood that it may serve in kindred machines in other arts.

MACHINE FOR MOLDING AND DRESSING STONE FOR BUILDINGS, ETC.

Patent No. 577,003, issued to George Montague Bowser, of Brisbane, Queensland, Feb. 16, 1897.

The object of this invention is to provide a machine for molding and dressing stone in a more efficient manner and at considerable less cost than can possibly be done by manual labor, and dispensing with rubbing in molded work, as is the usual practice when stone is dressed by hand, and is described as follows: Figure 1 represents plan of machine; Fig. 2 a sectional elevation on line A B, Fig. 1; Fig. 3 an end elevation; and Fig. 4 a side elevation.

A is a wooden frame bolted or otherwise securely fastened together. To this frame are bolted slides B of wrought or cast iron or other suitable metal. C is an iron tool-chest working in slides B and having a number of holes, as shown, in which are fixed by suitable means the necessary cutting-tools for dressing and molding the stone to be operated upon. The cutting-tools are made of iron and steel, or steel only, properly tempered, and can be made of any desired shape to suit the particular-shaped molding required, either for cornices, copings, architraves, channels, etc., and by the introduction of suitable tools the top and both sides of a stone can be dressed at one operation. C and C′ to C⁸ show tools in position for work, of which there may be any number; D, stone carriage, of solid timber or timbers, traveling on tram-rails *d* and supported on each side by guide-rails *d′*. Underneath the center of the carriage is a rack E, running the whole length and geared into the cog-wheel E′ on shaft F, supported on either end by pedestals F′ and F²; G, ratchet wheel, driven by eccentric H from main shaft J by pawl *h*, connected therewith by connecting-bar *h′*. The ratchet-wheel G is for propelling the stone-carriage forward as the tool-chest recedes, as hereinafter explained. K is part of main shaft J, on which are fixed two eccentrics *k*, connected to the tool-chest C for imparting to the same a short reciprocating motion, thereby causing the tools to operate on the stone. As the tool-chest is drawn back by the eccentrics *k* the stone-carriage D is propelled forward ready for receiving contact with the cutting-tools by succeeding forward motion of tool-chest. L is a fly-wheel; M and M′, fast and loose pulleys on main driving-shaft J; N, driving-belt lever and fork, *n*, *n′*, and *n²* are two loose and one fast pulleys on shaft F, driven by cross and straight belts direct from private motor or from counter-shaft, according to the convenience of circumstances. This gearing is for running the carriage backward or forward quickly when the stone is not being operated upon. O is a stop block or buffer, made either of iron or wood iron-faced and iron-bound, bolted to stone-carriage D, against which the end of the stone to be dressed abuts. Q, Q′, and Q² are iron eccentric chocks with projecting square end at top and projecting round end at bottom fitting into round hole in bed of stone-carriage D. These are for securely fastening stone to be operated upon in stone-carriage, are quick in action, and most effective. P is a piece of hard wood movable at will, and *p′*, *p²*, *p³*, *p⁴*, and *p⁵* battens of hard wood secured to stone-carriage D. The stone to be dressed or molded is placed against these battens. The piece of hard wood is placed against the opposite side and tightened up by means of the eccentric chocks Q, Q′, and Q² with a spanner. The clippings from the stone fall into the recesses formed by the battens *p′*, *p²*, *p³*, *p⁴*, and *p⁵*, and removed when necessary. R and R′ are iron ratchet-bars bolted or otherwise secured to each side of the stone-carriage D; S S′ to S⁵, steel pawls (of which there may be any number) suspended by cords or chains, as shown, attached to iron rings T and T′, which are connected by cords or chains to set of crank-levers U, which are for the purpose of raising and lowering the pawls. These pawls, of which there are two sets, one set to each side of the machine, fall into the ratchet-bars R and R′ and prevent the stone-carriage D from rebounding when the stone being operated upon comes into contact with the cutting-tools by the forward motion of the tool-chest C. The set of crank-levers U actuates the pawl *h* and when raised releases the pawl *h* from ratchet-wheel G, which immediately stops the stone-carriage D from traveling forward. Secured to the bottom of the stone-carriage D are two longitudinal slide-bars *d²*, of flat iron which rest upon the rails *d*. These are kept well greased to overcome friction.

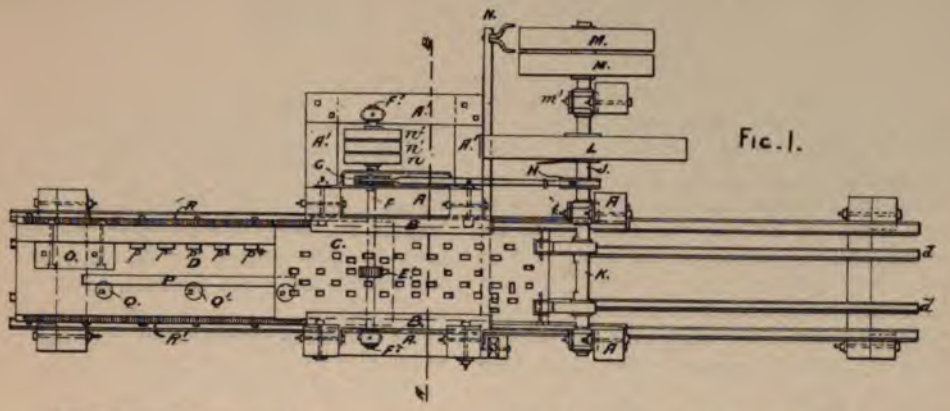


Fig. 1.

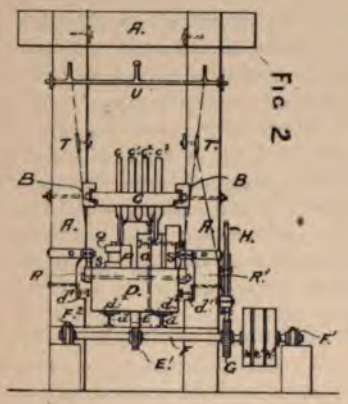


Fig 2

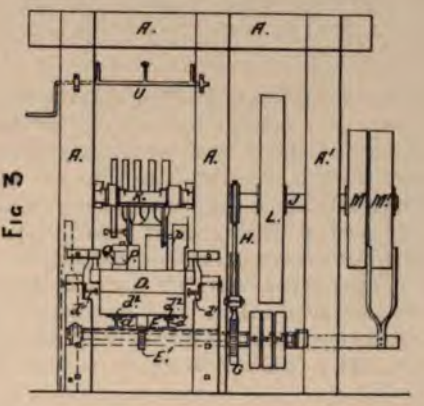


Fig 3

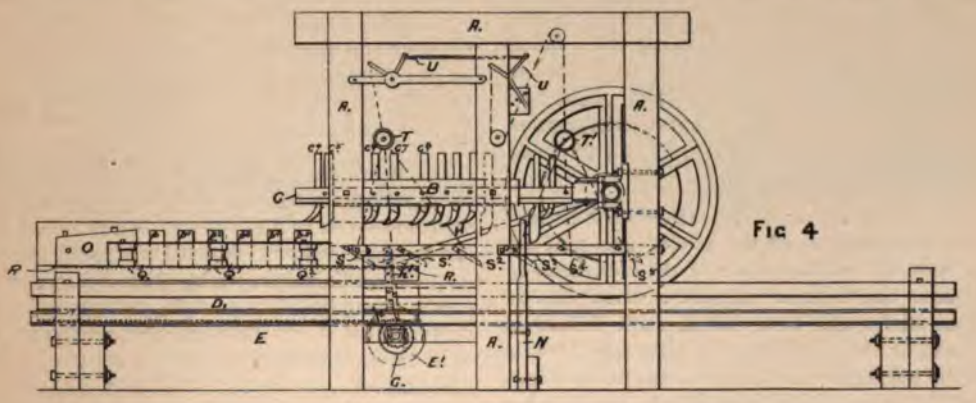


Fig 4

IT IS THE LAW.

Consideration in Building Contract.—A building contractor having defaulted before completion of the work, and having permitted liens to accrue against the property in violation of his bond, the contract was assigned to his sureties, and the balance of the price paid to them, on their agreement to finish the work and discharge the liens to an amount not to exceed the amount of the bond plus the amount paid them on the contract. The court held that such agreement was valid and was supported by a sufficient consideration.—McHenry *vs.* Brown, Superior Court, Minn., 68 Northwestern Rep., 847.

Liquidated Damages and Penalties.—Where a contractor binds himself in a fixed sum for the performance of the contract without stating whether such sum is intended as a penalty or as liquidated damages, and without regard to the magnitude or the number of breaches that may occur, or the amount of damages that may ensue, and the contract is such that it may be partially performed and partially violated, the sum so fixed is a penalty.—City of El Reno *vs.* Cullinane, Sup. Ct. Okl., 46 Pacific Reporter, 510.

What is Not Notice to Owner.—The fact that a sub-contractor is working on a house does not constitute notice to the owner not to pay the contractor under the law entitling a sub-contractor to lien upon notice to the owner. —Clark *vs.* Edwards, Sup. Ct. N. C., 25 S. E. Reporter, 794.

Mechanics Lien: When Contractor Cannot Produce Contract.—A mechanics' lien will not be defeated by the failure of the contractor to register the written contract, when that is required by the law, when such failure is caused by the fact that the written contract is in the possession of the owner of the building, and the latter refused upon demand to surrender it for registration.—Strang vs. Pray, Ct. Civ. App. Tex., 34 S. W. Reporter, 656.

Liability on Contractor's Bond.—Where a building contract, based on plans and specifications made a part thereof, provided that the contractor should make any alterations or additions required by the owner, the price to be subject to addition or deduction for same, as might be agreed upon, the sureties on the contractor's bond cannot defend against liability because the owner in completing the building after its abandonment by the contractor, as was authorized by the coutract, deviated from the specifications, nor because changes were made before the abandonment with the assent of the contractor.—De Mattes *vs.* Jordan, Sup. Ct. Wash., 46 Pacific Rep., 402.

Rights of Contractor on Partial Performance.—Where the owner of a building, pursuant to a provision of the contract for its construction, ejects the contractor because of his delay, the contractor is not entitled to recover in proportion to the amount of work done by him, but only the difference between the contract price and the amount which the owner had to pay to complete the building—Watts *vs.* Board of Education, Sup. Ct., App. Div., 41 N. Y. Supp. Rep., 141.

Effect of Estimate by Architect.—Where the owner and a building contractor have agreed that payments shall be made as the work progresses on estimates to be made by the architect, such estimates have the force of findings between the parties, and are binding on them unless impeached for fraud.—Kilgore *vs.* N. W. Tex. Bap. Ed. Soc., Supreme Ct. Tex., 35, S. W. Reporter, 145.

Discrepancies in Plans and Specifications.—Where the plans and specifications of a building were accessible to the builder before he made the contract, and an examination of them would have shown that there were apparent discrepancies in them, he is bound by a provision of the contract that if any discrepancies are found to exist between the plans, working drawings and specifications, the architect shall decide as to their true intent and meaning. And the fact that such architects drew the plans and specifications, and were to receive a compensation of 5 per cent. of the total cost of the building, will not warrant an inference of fraud in their decision.—Kelley vs. Muskegon, Sup. Ct. Mich., 68 N. W. Reporter, 282.

MACHINERY AND SUPPLIES.

[Matter appearing under this head is compiled and edited from data furnished by the advertiser, and should not be accepted as the opinion of the publishers.]

SLATE FOR ROOFING.

David McKenna of Slatington, Pa., is out with a very business-like price sheet and circular letter impressing upon architects, contractors, builders and roofers, the present low cost of manufactured slate. The wonderful cheapening processes used in latter-day production have revolutionized all former conditions, rendering this most durable of materials—once so expensive—now among the least costly for roofing purposes. From considerations of beauty, serviceability and ultimate economy slate roofs for centuries back have been universally favored in the Old World and the problem of cost being solved once for all will open the way to the same wide-spread use of slate on this continent. Interested parties will find much useful matter for reference in the tables, diagrams and notes, composing the make-up of Mr. McKenna's price list; and the progress made in slate-working machinery and manufacturing methods, hinted in his circular letter, will doubtless mark a new era in the consumption of his product for roofs and blackboards.

LITIGATION ENDED.

THE infringement suit instituted by the American Pneumatic Tool Co., of New York, against Thomas Phillips & Son, of New Haven, Conn., users of the Wolstencroft pneumatic tool, has been dismissed at the request of the complainant. The court's opinion and order are as follows:

UNITED STATES CIRCUIT COURT,
DISTRICT OF CONNECTICUT.

American Pneumatic Tool Co.
vs.
Thomas Phillips & Son.

TOWNSEND, District Judge. In equity. Motion.

In this case the testimony having been closed and a day fixed for final hearing, the complainant appeared in Court on said day and moved to dismiss the bill "without prejudice, on payment of costs, and the filing of a stipulation on the part of the plaintiff that the defendant's record may be used in any new suit which may be instituted against them by the complainant."

The only ground for said motion stated by counsel for complainant was that he wished to bring a new action against defendant.

It is unnecessary that the Court should at this time discuss the question raised in the briefs of counsel, or state its views as to the effect of the entry of the ordinary decree of dismissal. No sufficient reason having been shown for the insertion of the words "without prejudice" in the order, and defendant having objected to the proposed stipulation as to its record, the motion is denied.

At a Stated Term of the United States Circuit Court for the District of Connecticut, held in the U. S. Court and Postoffice Building, in the city of New Haven, on the day of March, 1897.

Present: HON. WILLIAM K. TOWNSEND, District Judge.

The American Pneumatic Tool Co., Complainant,
vs.
John H. Phillips and Thomas A. Bassett, doing business under the firm name of Thomas Phillips & Son, Defendants.
In Equity, No. 873.

This cause having been assigned for hearing on pleadings and proofs taken by both sides, and complainant having moved to dismiss the bill of complaint with costs, and no objection thereto being made by defendants,

It is ordered, adjudged and decreed, that the bill of complaint herein be and the same is hereby dismissed with costs to be taxed.

Approved as to form.

JOHN K. BEACH,
Solicitor and of counsel for defendants.

The makers of the Wolstencroft tool, as will

be seen in the advertisement in this issue, have organized for the exclusive manufacture of these tools, the new concern being known as the Wolstencroft Pneumatic Tool Co., of Philadelphia. It will probably open an office in New York City.

Among recent orders received by The Ingersoll-Sergeant Drill Company of New York is one from the Atchison, Topeka & Santa Fe system for a large duplex air compressor to be used at the shops of the Gulf, Colorado & Santa Fe railroad. The air cylinders of this compressor are cross compound and of the well known piston inlet type.

HELP WANTED.

Advertisements under this heading 10 cents per line each insertion.

WANTED—Large quarry company of New England wants practical working foremen, capable of stripping, clearing, opening and working marble quarries. Also expert channelers, gadders and drillers. State fully experience, references and pay wanted. Address F. J. ELLSWORTH, Case Building, Cleveland, O.

WANTED—A draughtsman who thoroughly understands all branches of stone-cutting, making patterns, estimating stone quantities from drawings. A practical man who has been in the business preferred. Address F. C., 726 Scranton St., Scranton, Pa.

TO SELL. TO BUY. TO EXCHANGE.

Advertisements inserted in this department for 15 cents per line each insertion.

FOR SALE.—One Ingersoll-Sergant Bar Channeler, with bits, in good order, cheap. One new C. Aultman Co. No. 4 Stone Crusher, with elevators. One new C. Aultman Co. 20 H. P. Engine, complete, cheap. Address, THE PLYMOUTH STONE CO., Plymouth, O.

WANTED—A counter sinker or dishing machine for basin slabs. Cheap for cash. State maker and price. MAXWELL & DEMPSEY, Jefferson and Cherry streets, New York City.

FOR SALE—One second-hand Ingersoll channeling machine in first-class order, for sale cheap. Apply to LORD, BOWLER & CO., Cleveland, Ohio.

FOR SALE—Quarries, etc., of the Chicago Brownstone Co. Supply inexhaustible. Membership in Quarrymen's Association with same and corporate franchise if desired—or will lease on royalty. CHICAGO BROWN STONE CO., 716 Reaper Bl'k, Chicago.

FOR SALE—Cheap, a four gang marble mill and quarries, located at Loudon, Tenn. This mill must be sold or leased within the next few months, and the best offer gets the mill. Will sell or lease mill separate from quarries if so desired; or will sell machinery. Address H. N. GREER, Loudon, Tenn.

SITUATIONS WANTED.

Advertisements under this heading inserted for subscribers to STONE *free of charge. Advertiser must send 25 cents to pay postage, if replies are to be addressed in care of* STONE. *Rate to non-subscribers, 10 cents per line each insertion.*

WANTED—Any quarry corporation in need of a thoroughly experienced manager or foreman would find it to their advantage to write to 20 PEARL street, Montpelier, Vt.

WANTED—Advertiser desires position with quarry owner or manufacturer, building or monumental work. Accustomed to management and experienced in plans, estimates, drawing, etc. Address, A. B., care of STONE.

WANTED—Position as manager and salesman, in good city, with a reliable firm, by a thorough granite and marble man, practical and experienced in all branches of the business. Best of references given. Moderate salary accepted for first year. R. H. C., care STONE.

TO QUARRYMEN—I would like a position as manager for some large quarrying firm. Have had twenty years' practical experience in the stone business. Would buy an interest in the business if satisfactory terms could be made. O. HURST, Fort Hunter, N. Y.

WANTED—A situation as superintendent or foreman of cut stone works. Twenty years' experience as a journeyman, foreman, superintendent and contractor; can give first-class reference; strictly sober and systematic. Salary reasonable for a first-class man. Address A. YOUNGBLOOD, 184 Second Ave.

ASSIGNEE'S SALE.

CHICAGO, March 20, 1897.

The undersigned will receive sealed bids for the assets of Davidson & Sons, located at foot of North Market, now Orleans street, Chicago, Ill., in his hands as assignee, as follows:

1st—Four Barre monuments numbered 2556, 2561, 2567, and 2568, respectively; also one Westerly monument, No. 2555, and one Red Scotch monument, No. 2563.

2d—For all the machinery separately.

3d—For all the office furniture separately.

4th—For the entire stock of granite separately.

5th—For the entire stock of cubic marble separately.

6th—For the entire stock of thin marble separately.

7th—For all the machinery and so much of the stock of marble, granite, etc., as the purchaser may desire.

8th—For all the machinery and the entire stock of marble, granite, etc., in the assignee's possession.

All bids shall be opened by the County Court of Cook county, Illinois, on Tuesday, April 20, 1897, at 10 o'clock a. m. The assignee reserves the right to reject any and all bids. Mark the envelope containing bids with the word "Bid."

JOSEPH UHRIG, assignee, foot of Orleans St., Chicago, Ill.

HOLLETT & TINSMAN, 84 La Salle street, Chicago, Ill., attorneys.

Edwards, Macdougal & Co., 180 W. Regent St., GLASGOW, SCOTLAND.

STONE MERCHANTS,

Rouge Granite, Seynite, Marble and Sandstone for Building and Monumental purposes. Paving stones. Curbs and Setts for Roadways.

Correspondence Invited.

"OLE EZ. PERKINS."

EZ. PERKINS was the greatest cuss
Fer tellin' lies 'at ever wuz.
There wan't a thing beneath the sun
That Ez. would say he hadn't done,
And done a durn sight better than
Just 'ary other livin' man.

An' if a feller'd go ter tell
A yarn, t'would start up Ez. an'—well!
That other feller'd simply quit
When Ezry got agoin' it.

So when he struck the town one day
A staggerin' in the queerest way,
An' sez, "Well, boys, I guess I'm done;
A rattler's bit me,"—everyone
Just grinned and winked the other eye
An' sez, "Here comes another lie."
But Ez. just fooled us, for at that
He reeled and tumbled over flat.
An' then Doc. Simmons cum an' sez,
"Boys, here's the last of pore ole Ez."

We all felt bad, I tell you now,
An' some one sez, "Well, I'll allow
It was a rattler, coz I see
One ten foot long—" Well, hully gee!
No wonder that he looked surprised,—
Ole Ez. was openin' up his eyes,
An' in a voice we just could hear,
Sez he, "*This one was forty, clear.*"
An' then a smile passed o'er his lips,
An' calmly he passed in his chips.

'Twas quite a spell 'fore we'd agree
What Ez.'s epitaph should be.
We wanted somethin' plain and neat
That told his virtues all complete.
An' that, you see, just made it bad:
We couldn't think er none he had.
But finally we put "A mere
Plain speaker of the truth
lies here."
And, when we got it done, we
sez,
There! That's a lie 'ud tickle
Ez."

—Joe Lincoln, in L. A. W. Bulletin.

"Times are hard, but then we cannot get along without Stone, especially when we consider your STONE the cheapest on the market."
—James Farrell, Covington, Ky.

NEW JERSEY CAR AND EQUIPMENT CO. | Lake View, N. J.

STANDARD GAUGE EQUIPMENT FOR SALE.

One 10"x16" cylinder, Saddle Tank Locomotive, price $900.

Two 10"x14" cylinder, Inclosed Steam Dummy locomotives, price $750 each.

These engines have just been through our shops, and are in A1 order.

Seven Contractors' 5 cu. yds. capacity side dump cars, dumping either side. Good as new. Price, $45.00 each.

Fourteen four-wheel Trucks, in good order.
One large Steam Shovel, has had little usage.

HOW ABOUT ROCK DRILLS?

I have the following for sale:

5 No. 1, 2¼ in. Rand "Little Giant" Rock Drills.
8 No. E 26, ¾ in. Sergeant Rock Drills.
40 No. F 2, 3½ in. Ingersoll Rock Drills.
12 No. 4, 3⅝ in. Rand "Little Giant" Rock Drills.

All repaired and in guaranteed condition.
All the same price—$125 each, including Tripod and weights.
Can furnish immediately.
I also have Channelers, Compressors, Hoisting Engines, etc.
You want some of these. Act promptly.

WILLIS SHAW,
Contractors' Machinery,
506 N. Y. Life Bldg., Chicago, Ill.

SECOND-HAND PLANERS

Especially Adapted for Stone.

60 in. Pond Planer, planes 25 ft. long, heavy.
48 in. Wood & Light Planer, planes 10 ft. long, heavy.
38 in. Pond Planer, planes 10 ft. long, medium.
37 in. New York Steam Engine Co. Planer, planes 12 ft. long, heavy.
36 in Pond Planer, planes 16 ft. long, heavy.
30 in. Pond Planer, planes 7 ft. long, medium.
30 in. Pond Planer, planes 8 ft. long, heavy.
28 in. Putnam Planer, planes 8 ft. long, heavy.
24 in. Flather Planer, planes 6 ft. long, heavy.
24 in. New Haven Planer, planes 6 ft. long, medium.
24 in Putnam Planer, planes 7 ft. long, medium.
25 in. Huebner(Screw) Planer, planes 5 ft. long, medium.

We also have a lot of SECOND-HAND LATHES suitable for turning pillars, posts, etc., both stone and marble. 6 to 40 inches diameter, and any length.
Kindly write us and we will give you valuable information.

Prentiss Tool and Supply Co.

115 Liberty St., NEW YORK.
Chicago Store, 62 and 64 South Canal Street.

BOOKS AND PERIODICALS.

Two of the briefer articles in the April *Review of Reviews* discuss the question of direct employment of labor vs. the contract system on municipal works. Sylvester Baxter cites Boston's experience with direct work in various municipal departments to show the superiority of that method over the contract method, while Mr. George E. Hooker, of Hull House, Chicago, exposes the inadequacy of the contract system as applied to street-cleaning in that city.

McClure's Magazine for April will contain a series of unpublished letters written by General Sherman to a young lady between whom and an army officer the General undertook to re-establish a broken romantic relation. The letters embody a story as good as any piece of fiction, and exhibit Sherman in a very charming way.

Beginning with the April number *McClure's Magazine* will hereafter be published on the first day of each month. April 1 the April number will be on sale on all newstands and delivered to all subscribers, from the Atlantic to the Pacific; and thereafter exactly on the first day of each month a new number will be published. Heretofore publication has been made on the 28th of each month; but it is believed that the change to the 1st will be to the general convenience.

The publishers of the *Atlantic* announce that the third edition of the March issue of the magazine is now ready. The unusual demand for this number has completely exhausted two editions, and the third is now ready for delivery. The widespread interest in public affairs in this country is well illustrated by the large sale of the March issue of the *Atlantic*, which contains John Fiske on the Arbitration Treaty and Woodrow Wilson on President Cleveland. The scholarly treatment of the subject by John Fiske makes the intricacies of this treaty wonderfully plain and shows it in all its broad significance. The recent inaugural ceremonies at Washington, closing the career of Mr. Cleveland as our chief magistrate, bring him more than ever before the public eye, and Mr. Wilson treats his career with judicial fairness and genuine enthusiasm.

"Austin's Stone Road Machinery" is the title of a sumptuous catalogue whose 76 pages abound in exquisite engravings. The "Introduction" indulges its readers to a sketchy reminiscence of the history of the F. C. Austin Manufacturing Company, Chicago, which, it would appear, is contemporaneous with the birth and growth of improvement in road-making, rock-crushing, and well-boring machinery and irrigation appliances. The impetus given the introduction of road implements by the Austin stimulus, since 1849, would seem to be the co-efficient of progress marked by the wood, iron and, lastly, the steel ages of invention through which road machinery has developed. The catalogue displays, we think, a good deal of literary ability too, and deserves the distinction of being considered a brochure rather, for the reason that the "shop talk"—which is inseparable from the purpose of catalogues—is happily relieved by good authorship and a profusion of pictorial subjects both interesting and instructive to all who are concerned in the "good roads" problem. Even the spice of humor is not lacking, but is here and there effectively employed by the artist to season the thought of the writer. Altogether this catalogue impresses us as being a dignified example of business literature, worthy the company whose manufactures it is well designed to popularize. Copies free on application to company's offices. See their "ad" in this issue.

The Wolstencroft Pneumatic Tool.

ADAPTED TO CUTTING, CARVING and LETTERING

Granite,
Marble,
Bluestone,
Onyx and
Limestone.

SUCCESSFULLY IN USE AT MANY OF THE LARGEST WORKS IN THE UNITED STATES.

PATENTS HAVE BEEN SUSTAINED BY THE COURT.

We contract for the complete installation of plants, including Air Compressors of most approved types, pipe line and all fittings.

PRICES REASONABLE.
MACHINERY GUARANTEED.

Fair Treatment Shown all Patrons.

Address

4. ANVIL.

3. BUSHING.

2. HAMMER.

1. VALVE.

WOLSTENCROFT PNEUMATIC TOOL CO.,

(Frankford) PHILADELPHIA, PA.

Please mention STONE when you write to advertisers.

CONTRACT NEWS.

Buffalo, N. Y.—Representative Wadsworth has reintroduced into congress a bill appropriating $20,000 for the erection of a monument to Robert Morris at Batavia, N. Y.

Chatham, Va.—The United Daughters of the Confederacy will erect a Confederate monument, to cost about $2,000.

Indianapolis, Ind.—It is announced that Senator Leich has introduced a bill appropriating $100,000 more to be raised by taxation for the completion of the soldiers' and sailors' monument.

Harrisburg, Pa.—Senator Hardenbergh, of Wayne county, has introduced a bill ln the State Senate appropriating $3,000 to erect a monument to General Samuel Meredith, the first treasurer of the United States.

Washington, D. C.—The senate library committee presented March 25, a favorable report on the bill introduced by Senator Cullom of Illinois, appropriating $50,000 for a statue of Lincoln at Gettysburg, Pa.

Newark, N. J.—The trustees of the First Reformed Church have bought a site, corner Clinton and Johnson avenues, and will erect a handsome edifice on it.

Vicksburg, Miss.—The building committee of the Crawford Street M. E. Society, which has $10,000 in subscription, has decided to commence work on the new church.

Springfield, Ohio.—Sealed proposals will be received at the office of Samuel J. Wilkerson, city clerk, until April 19, 1897, for furnishing the material and constructing the foundation and abutments for a bridge over Buck Creek in Snyder Park. Bids will be received for limestone and also for sandstone. Certified check, $1,000. Also for constructing and erecting the superstructure for said bridge. Bidders are required to furnish their own details. Certified check, 10,000.

Rochester, N. Y.—A bill was passed in the legislature appropriating $30,000 for a bridge over the Erie Canal at Monroe avenue. No contracts have as yet been let.

Galveston, Texas.—Plans have been prepared by Architects N. J. Clayton & Co., for the erection of a court house here for Galveston county. To be fire-proof. Constructed of pressed and ornamental brick, granite, marble, terra-cotta and stucco, with stone trimmings. Steam heat, elevators, plumbing, electric lighting, marble and mosaic work, etc. Cost, $183,750.

South Bend, Ind.—James and J. D. Oliver contemplate spending about $40,000 in remodeling and enlarging their hotel building, the Oliver House.

San Francisco, Cal.—A new hospital is soon to be erected on the site of the present St. Luke's Hospital building which is located on Valencia street, near Twenty-seventh. The style will be renaissance. Stone will be used for the foundation, buff brick for the walls, and terra-cotta for the roof. Will have a building for cold storage, laundry, heating and ventilating plant and machinery for electric and sterilizing purposes. Cost about $100,000.

Essex, Conn.—Architect Joseph W. Northrop, Bridgeport, has plans for St. John's Episcopal Church at Essex ready for estimates. The building will probably be of granite. Estimated cost $20,000, Rev. Percy T. Fenn, pastor.

Raleigh, N. C.—The Episcopal congregation of the Good Shepherd proposes building a church at an early date. Rev. I. McPittenger, Rector.

Chicago, Ill—The Normal Park Presbyterian Society will let contracts for the erection of a new church in April. Rev. Wm. Hindman, Pastor.

Morris City, Ill.—The M. E. Society proposes to build a new church this season.

La Porte, Ind.—Wing & Mahurin of Ft. Wayne have prepared plans for the church to be erected by St. Paul's Episcopal Society this spring. Rev. T. B. Barlow, Pastor.

Newark, N. J.—It is reported that Rev. H. J. White has accepted the plans of Architect C. Edwards, of Patterson, for the erection of the St. Columbus Catholic Church in Newark, which is estimated to cost $100,000.

Waterloo, N. Y.—M. L. Van Kirk the Waterloo Architect, has completed plans for the new Babtist Church in that place.

Toledo, Ohio.—Plans have been prepared by Architect E. O. Fallis, of Nasby Tower, for the erection of a very handsome church for the St. Paul's M. E. Society. To be constructed of stone, brick, granite and terra-

VICTORY FOR THE BOYER HAMMER.

To the Trade:

We are pleased to state that on January 7th the United States Circuit Court of Appeals, at New York, in the infringement suit brought by The American Pneumatic Tool Company against the Bigelow Company, of New Haven, Conn., for using the Boyer Hammer, decided in favor of the defendant, and reversed the decision of the lower court, thus confirming the position we have always taken, and the assurances which we have given the trade, that the Boyer Hammer did not infringe the patents of the American company, and furnishing a complete answer to the threats and misrepresentations which that company have been making with respect to the Boyer Hammers.

In addition to our regular Boyer Hammers, which are familiar to the trade and have acquired such a high reputation, we are now prepared to furnish a still further

improved style of hammer, which we have designated The New Boyer. The valve mechanism of this new hammer is entirely different from the old, and is designed to accommodate an increased length of piston chamber and an increased length of piston stroke, and consequently materially increase the force of the blows of the piston in a tool of given size, without increasing the length of the tool as a whole. It also reduces the vibration of the hammer to practically nothing, so that in both of the above respects the new hammer is superior to the old. We are prepared to furnish either style. ALL TOOLS SENT ON TEN DAYS' TRIAL, SUBJECT TO APPROVAL, AND GUARANTEED FOR ONE YEAR AGAINST REPAIRS. Our new catalogue is in the hands of the printer, and is now ready for distribution. We desire to have all stone-workers possess a copy of it. Furnished free on request.

CHICAGO PNEUMATIC TOOL CO.,

635 Monadnock Building, Chicago, Ill.

cotta. Have steam heat, marble and mosaic work, pipe organ, pews, mantels, plumbing, plate and cathedral glass, and all modern improvements. Cost $60.000.

Stillwater, Minn.—The congregation of the Swedish Lutheran Church will start construction this season on a handsome cut stone church on the lot adjacent to the parsonage.

Springfield, Mo.—It is reported that an election will be held April 6 to vote on building additions to schools in this city.

Lagrange, Texas.—The Katy depot and the town hall were destroyed by fire March 10, causing a loss of $8,000, partially insured. Will be rebuilt immediately.

Crowley, Texas.—Mrs. John Haley is building a fine new hotel at this place. The citizens met a few nights ago and decided to build a fine college at Crowley. Address the Mayor for particulars.

Michigan City, Ind.—The improvements called for in the legislature appropriation just made for the northern prison include $14,000 for water works, $8,000 for a new chapel, $21,000 for a new hospital, $8,000 for plumbing and heating and $20,000 for general repairs. There is allowance made for the warden's new residence, and $3,000 is allowed for an architect. About 32,000 feet of piping to the lake is included in the water works appropriation.

Leavenworth, Kan.—The architectural plans for the new United States prison have been completed and sent from Washington. Each cell will have separate plumbing and ventilation. The value of improvements when completed will be about $1,200,000. Buildings will cover 17 acres.

Lima, Ohio.—The bids for building the Dayton Northern depot were all rejected. Plans and specifications on file at the office of the architects, Leach & Leach.

Babylon (L. I.), N. Y.—The plans for remodeling the county jail, in accordance with plans and specifications presented by architect Skidmore, were accepted and the proper committee authorized to advertise for bids. Cost, $15,000.

Lansing, Mich.—The biennial report recently issued by the State Board of Education shows the State Normal School at Ypsilanti and Central Michigan Normal School at Mt. Pleasant, to be in an excellent condition. The plans for the new training school building of the former institution exceeded the $25,000 appropriation. The Board decided to erect only part of the building now.

Topeka, Kan.—The legislature has made an appropriation of $60,000 for the erection of an an additional ward to the Topeka Insane Asylum.

Little Falls, Minn.—It is reported that the school board has adopted plans prepared by Otto Scalasner for the erection of a $20,000 school building.

Washington, D. C.—The Government Board of Managers of the National Home for Disabled Volunteer Soldiers met here March 23 in annual session. Preparatory action was taken for the erection of a new branch home at Danville, Ill., for which an appropriation of $200,000 will become available shortly.

Pittsburg, Pa.—Arrangements have been made by the First Methodist Episcopal Church Society of Vandegrift, for the erection of a church building. Plans have been prepared by Architect J. E. Allison. To be built of iron mottled brick and trimmed with Cleveland stone. Cost $16,000. Rev. N. G. Miller, of Apollo, at present has charge of the church.

Marquette, Mich.—The Negaunee Methodist Church Society wants a new church. A building to cost not more than $10,000 is spoken of. A new parsonage will also be built. Address W. J. Allen.

Philadelphia, Pa.—Isaac Purcell, 119 South Fourth street, is preparing plans for the new East Park Presbyterian Church which will be built at Thirty-second street and Montgomery avenue.

Indianapolis, Ind.—Adolph Sherrer has been appointed as the supervising architect for the new station house building. The building when completed will cost $150,000.

Ipava, Ill.—The town is preparing to vote on the question of issuing $12,000 in bonds for the purpose of building a school house.

Red Wing, Minn.—The city will vote on the question of issuing $15,000 school bonds.

Passaic, N. J.—Plans have been prepared for the new court house to be erected at this place, and will advertise for bids very soon.

Philadelphia, Pa.—The National Sangerfest is to be held in this city during the week of June 21. The largest auditorium ever used in

Rock Crushers and Screens. Horse Road Rollers.

Street Sweepers and Sprinklers.

Reversible Road Graders. Scrapers and Railroad Plows.

Largest and best established line of "Good Roads" machinery in the world.

AUSTIN & WESTERN CO., Ltd.,

70 No. Carpenter Street, CHICAGO.

VULCAN STEAM SHOVELS

Received Highest Award at World's Fair.

VULCAN IRON WORKS CO., TOLEDO, O.

Manufacturers of "Reilly" Brake Shoe.

QUARRYING AND CONTRACTING Machinery.

CATALOGUE ...ON... APPLICATION.

ST. PAUL, MINN.

CHICAGO, ILL.

CINCINNATI, OHIO.

NEW YORK, N. Y.

AMERICAN HOIST AND DERRICK COMPANY.

CHICAGO—60 S. Canal St. ST. PAUL, MINN. CINCINNATI—Carew Bldg.

NEW YORK—Havemeyer Building.

Stone and Marble Cutters' Mallets

J. B. HELLENBERG,
Coldwater, Mich.

Our mallets are giving splendid satisfaction on all kinds of Stone and Marble. Strictly first-class second growth hickory Write us. for prices, etc.

Gasoline Engines....

For pumping water from quarries this is the best, most reliable and cheapest engine.

Catalogue free.

The VAN DUZEN GASOLINE ENGINE CO., Cincinnati, O.

this city will be erected; will seat 10,000. Style to be German Renaissance. The structure will cost in the neighborhood of $40,000.

Huntsville, Ala.—After consultation for several days, the commissioners decided to reject all bids for constructing a new county jail. The court will now secure an approved plan, secure bids thereon, and let the contract to the best bidder.

Hamilton, Mo., is in the field with an offer to make the people of Caldwell county a present of a new $25,000 court house, provided they will locate the county seat there.

St. Paul, Minn.—The citizens of Duluth have donated to the State six acres in the eastern end of the city, and the normal school board has recommended that the legislature appropriate $70,000 toward the construction of a suitable building to put upon this land. Jas. T. Hale, a prominent Duluth mining man, will give further information.

Parkersburg, W. Va.—The county commissioners of this county have decided to build a new court house. It will be built on the site of the present one and will cost $150,000.

Canton, O.—L. W. Thomas will prepare plans for a new court house. The new building will cost over $100,000. Address county commissioners.

Cairo, Ill.—Plans have been prepared by Architect M. E. Bell, Chicago, for the erection of a large high school building at Cairo. To be constructed of brick and stone. Cost, $30,000. J. S. Jenkins, secretary, may be addressed further.

New York City.—Architect George M. Walgrove is preparing plans for a one-story brick and stone penitentiary for the city, to be erected on Blackwell's Island. Cost, $175,000.

Toledo, Ohio.—Proposals are asked for a stone church for the St. Paul's Methodist Episcopal Church Society, of this city. Bids may be made for part or the entire work. The complete plans and specifications with blank proposals may be seen at the office of E. P. Breckenridge, Chairman of Building Committee; $60,000 has been provided for the church building complete.

For polishing, rubbing, sawing Granite or Marble nothing can surpass our Chilled Steel; price $3.75 in 100 bags. Townsend & Townsend, 156 Fifth Ave., New York.

Lake Geneva, Wis.—Plans have been prepared by Architect Henry Lord Gay, of Chicago, Ill., for the erection of a large hotel, to cost about $100,000.

Hallettsville, Tex.—The Lavaca county commissioners have decided to build a new court house. It is proposed to expend $75,000. The commissioners will investigate plans and specifications.

Anderson, Ind.—T. M. Norton Brewing Company, owners. Boyer & Rautort, Chicago, Ill., architects. Stock house for brewery. Contract not let. Cost, $16,000; 37x42; four-story and basement. Brick and stone; stone trimmings.

Des Moines, Iowa.—Plans have been prepared by Architect George Hall, of Des Moines, for a very handsome new union depot here. To be used by the Great Western, Des Moines Union, Wabash, and Des Moines, Northern & Western railroad companies. To cost about $120,000.

Raleigh, N. C.—Good Shepherd church will build a new edifice, to cost from $50,000 to $65,000. Plans are wanted. Address Dr. McNight Pettinger.

St. Louis, Mo.—The Bnai El congregation held a meeting at its synagogue on Tenth street and Chouteau avenue, recently, and discussed the project of building a new house of worship. It is the general understanding that the new church, which will cost about $30,000, will be located in the southern part of the city, and further west than the old synagogue. Rev. Dr. M. Spitz is rabbi of the congregation.

Downer's Grove, Ill.—Arthur Peabody has designed St. Andrew's Church, all in stone except a porch gable of timber, and in the early English rustic style, or its forerunner, the Norman. To be erected early in the spring. Wm. A. Waples is member of the finance committee.

Wilkes-Barre, Pa.—Architect Charles Burns, Philadelphia, is preparing plans for a church which will cost $75,000, that is to be built at Wilkesbarre, Pa., for St. Stephen's Episcopal Church. Rev. H. L. Jones, Rector.

Springfield, Ill.—The negroes of the United States will build a Lincoln Memorial church at Springfield. Plans have been drawn and considerable amount has been already subscribed. It will be built of Bedford stone, slate roof. Estimated cost, $50,000. Contract will not be

WATERPROOF
GRAPHITE GREASE
FOR WIRE ROPES, GEARS, ETC.

An unequaled lubricant which will not wash off. It may pay you to send for circulars.

JOS. DIXON CRUCIBLE CO., JERSEY CITY, N. J.

A. LESCHEN & SONS ROPE CO.,

——Manufacturers of——

All genuine Hercules Wire Rope is made with a Red Strand.

Best on Earth.

[Trade Mark Registered.]

920 & 922 N. Main St., ST. LOUIS, MO.

Send for Catalogue. ——CHICAGO OFFICE & WAREHOUSE: 19-21 S. CANAL ST.—— Correspondence Invited

BRODERICK & BASCOM ROPE CO.,

——MANUFACTURERS OF——

The Most Durable Rope made.

IT HAS NO EQUAL.

AND ALL GRADES OF

Iron and Steel Ropes and Street-Railway Cables,

ST. LOUIS, MO.

let until the fund amounts to two-thirds of es timated cost. Rev. J. S. Woods, Springfield, is secretary.

St. Louis, Mo.—Tyler Place congregation. Committee on ways and means, Messrs. Chas. Hake, Wm. Bonsack, J. B. Reder and E. G. Eberlin. Propose erecting new church. Bedford stone, slate roof, marble in interior. Funds in hand. Plans drawn. Cost about $25,000.

Chippewa Falls, Wis.—Christ Episcopal church was destroyed by fire. Loss, $12,000. Insurance, $4,000. It will probably be rebuilt at once. Rev. E. J. Evans, rector.

Dallas, Tex.—The Second Presbyterian Society propose to build a new church. Estimated cost $10,000. Rev. W. M. Anderson, Pastor.

Wabash, Ind.—The official board of the M. E. Church has decided to erect a new house of worship. It will cost $35,000 for the building alone, and it is proposed to spend another $10,000 for furniture, making the total cost of the new church $45,000.

Pittsburg, Pa.—Architect J. E. Allison has prepared plans for a magnificent church for the congregation of the First Presbyterian Church of this place. Cost $16,000.

Lead, S. Dak.—An election will be held to vote on the question of appropriating $15,000 for the erection of a jail.

Darlington, Wis.—The citizens here are urging the State Board of Control to condemn the present jail and build a new one. Address the city clerk of Darlington for particulars.

Louisville, Ky.—An appropriation of $45,000 has just been made for the erection of two school buildings in this city. The president of the Board of Education will give particulars.

Jefferson City, Mo.—Davis, of Pike, introduced a bill in the House to-day providing for the erection of a monument on the capitol grounds to the memory of Joe Bowers, of Ballad fame. The monument is to be erected by private subscription.

Detroit, Mich.—A lot in the Union cemetery in Richfield township, Genesee county, has been offered as a site for a soldiers' monument, which will be erected by the Davison G. A. R. post this spring.

Italian Statues, Busts, Medallions, Altars of the finest Marble. Townsend & Townsend, 156 Fifth Ave., New York.

New York, N. Y.—H. J. Ellicott, of Washington, D. C., has submitted his model for an equestrian statue to Gen. Slocum in the competition opened by the State of New York, which has appropriated $50,000 to erect a monument to the hero of the battlefield of Gettysburg.

Bellefontaine, O.—This town is to have a new Catholic church. Plans by Architect Gault. Cost, $10,000.

Annville, Pa.—J. E. Hiester will give particulars relative to the erection of a fine new church at Campbelltown, this state. Plans for same are now being prepared. The church will be constructed of stone and cost about $8,000.

Marshalltown, Iowa.—The trustees of the Baptist Society are considering plans for the erection of a $15,000 church.

Wabash, Ind.—The M. E. Society proposes to build a new church at a cost of $35,000.

Columbus, Ga.—The St. Luke Society has decided to expend $20,000 in the erection of a new church.

Oshkosh, Wis.—Plans have been prepared by Architect E. E. Stevens, for the erection of a Polish Catholic Church, at Oshkosh, to have all the modern improvements and cost about $10,000.

Ackley, Iowa.—Plans have been prepared by Architect J. H. Prescott, of Marshalltown, for the erection of a new church building for C. H. Dapke of Ackley. To be constructed of brick and stone. Bids will be received until April 19. The structure will cost about $15,000.

Clarksville, Tenn.—A county bridge will probably be constructed over the Cumberland river near here. The probable cost will be $50,000. Squires Finis Ewing, John Baggett and E. G. Dunlavy will investigate and report as to the construction of said bridge.

Conroe, Tex.—Sealed bids will be received at the next regular term of the commissioners' court, May 10, for the erection of the following bridges: A bridge across the gully on the Conroe and Deaker's Prairie road, and one across Hill creek on the Montgomery and Houston roads, in accordance with plans and specifications to be furnished by Thomas Ballard, commissioner. M. S. Cooper, county judge.

Pittsburgh, Pa.—The United States Government is advertising for bids for Monongahela

ELECTRIC BLASTING

VICTOR ELECTRIC PLATINUM FUSES

Superior to all others for exploding any make of dynamite or blasting powder. Each fuse folded separately and packed in neat paper boxes of 50 each. All tested and warranted. Single and double strength, with any length of wires.

"PULL-UP" BLASTING MACHINE.

The strongest and most powerful machine ever made for Electric Blasting. No. 3 fires 30 holes. No. 4 fires 50 holes. No. 5 fires 100 holes. They are especially adapted for submarine blasting, large railway, quarrying and mining works.

VICTOR BLASTING MACHINE.

No. 1 fires 5 to 8 holes; weighs only 15 pounds, adapted for prospecting, stump blasting, well sinking, etc.

Standard Electric Fuse and Blast Tester, Wire Reels, new design, Leading and Connecting Wire.

—MANUFACTURED ONLY BY—

JAMES MACBETH & CO., No. 128 Maiden Lane, New York City.

Send for catalogue.

GEORGE C. UNDERHILL, RUTLAND, VERMONT.

Specialist in Stone.

Service in Courts. Examinations and Reports on Marble, Onyx, Dolomite, Talc, Lithograph and other stones. Advice in selecting machinery for quarry, mill or shop; also in marketing, and assisting new concerns to get under way generally.

THE CONTRACTORS' PLANT MFG. CO.,

129 ERIE STREET,

Buffalo, N. Y.

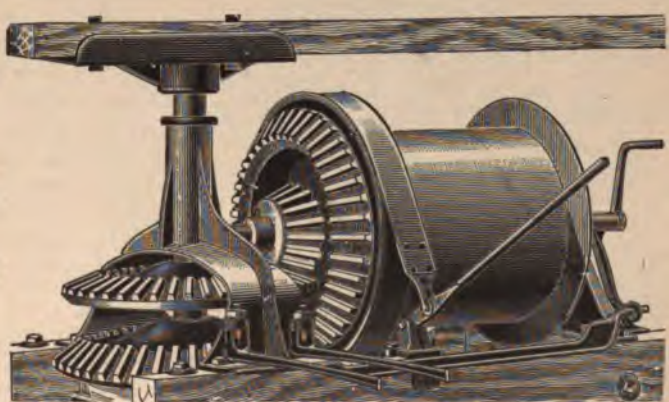
DERRICKS,

Contractors' and Quarrymen's

SUPPLIES.

Horse Power

HOISTING MACHINERY.



and Allegheny river improvements, including six locks on the Monongahela river and two locks and dams on the Allegheny river, amounting altogether to $2,300,000. The bids will be opened April 27.

Denver, Col.—Work will begin at once on the two branch lines of the Gulf leading to the stone quarries at Stout and Arkins, Col. This statement, issued from the Gulf offices, means that the two immense quarries will be thrown open to stone-cutters and thousands of dollars expended on the branches, five and nine miles in length, respectively. The quarries have been closed ever since the financial depression.

Bangor, Me.—The buildings in West Monson of the Consolidated Slate Company, a mile from Monson, which were burned two months ago, have been rebuilt. The quarry was started recently. It is a big boom to the town, as quarry hands have been idle since the fire.

Norwalk, O.—Plans have just been prepared for the construction of a $15,000 opera house.

Syracuse, N. Y.—Plans for a $500,000 structure, to be known as the University Building, are accepted. Foundation will be of granite. Green & Wicks, architects.

Lockport, N. Y.—The Odd Fellows talk of building a $40,000 block.

Upper Sandusky, O.—The coming spring election will deal with the question of the $150,000 court house now being agitated.

Oxford, Ga.—Architect S. M. Patton has drawn plans for a very handsome library building for Emory College. The building will be of stone and marble, of handsome design, and will cost about $40,000.

Erie, Pa.—Plans have been prepared by Architect Joseph Frantz, of 108 State street, for the erection of a three-story school house for the St. Mary's Catholic Church. To be constructed of stone. Cost about $40,000.

St. Louis, Mo.—Plans have been prepared by architects Wheeler & McClure, of the Union Trust Building, for the erection of an eighteen-story office building for B. F. Small of the Security Building. To be built of buff brick and terra cotta and stone; have elevators; steam heat; marble and mosaic work; plumbing, electric light, etc. Cost, $800,000.

Lansing, Mich.—Negotiations are going on for the erection of a $125,000 hotel, five stories high, with 66 feet front, to be located near the City Hall. Boston capital is interested.

Indianapolis, Ind.—Bills were passed authorizing the commissioners of Allen, Jasper and Stark counties to issue bonds for the construction of court houses.

Philadelphia, Pa.—Eight citizens have pledged themselves for $275,000 for the new Western Hospital and work on the new structure will begin in the near future.

Boston, Mass.—After a year's haggling the Grand Lodge of Massachusetts, F. and A. M., have decided to erect a new building on the present site, Tremont and Boyleston streets, or to remodel the old temple, which was damaged by fire on Sept. 7, 1895. The directors were given full power to act, the amount they are to expend being limited to $500,000.

Dubuque, Iowa.—The $50,000 endowment made by Abraham Shimmer has been paid over to the Finley Hospital committee. The committee will immediately advertise for plans and estimated cost. F. A. Rumpf, chairman.

New York City.—Bids are in order for the new "Tombs" prison, to be erected on the site of the old structure. Plans of Architects Withers & Dickson have been accepted by the Board of Estimate and Apportionment. It is expected two years will be required to complete the building and the total cost is put at about $720,000.

Philadelphia, Pa.—Pittsburg is soon to have a $200,000 hospital, with 314 beds. It will be a very handsome structure and will have all the modern conveniences.

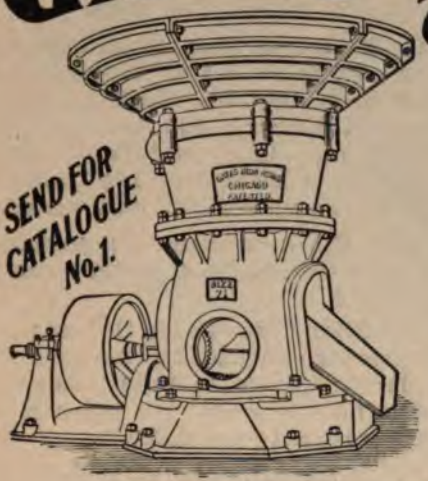
Frederick, Md.—A company has just been formed for the purpose of building a hotel at Braddock Heights, five miles west of Frederick, at a cost of $30,000. G. W. Smith, who is interested in the new company will give particulars.

Roxbury, Mass.—Joseph H. Chadwick, president of the Joseph Warren Monument Association, may be addressed concerning erection of statue to Gen. Joseph Warren, on Warren street.

New Orleans, La.—Funds are being raised by the school children of this city to erect a $6,000 monument to John McDonough, who bequeathed more than $1,000,000 to New Orleans for educational purposes.

Jefferson City, Mo.—The present legislature passed a bill introduced by Senator Seaber appropriating $3,000 for the erection of a monument upon the battlefield of Shiloh, in memory of the Missouri troops on both sides who took

GATES ROCK AND ORE BREAKER



SEND FOR CATALOGUE No. 1.

For Crushing Stone in all its forms is right, and there is only one right.

The Latest Model is Better and Cheaper than ever...

Our Catalogue is explicit, and can be had on application.

Designs for Complete Plants Free to Customers...

Our Jaw Crushers are also used very extensively

MINING MACHINERY as Manufacturedby us, is of HIGHEST GRADE ONLY.

Write us for information. We can serve your interests satisfactorily.

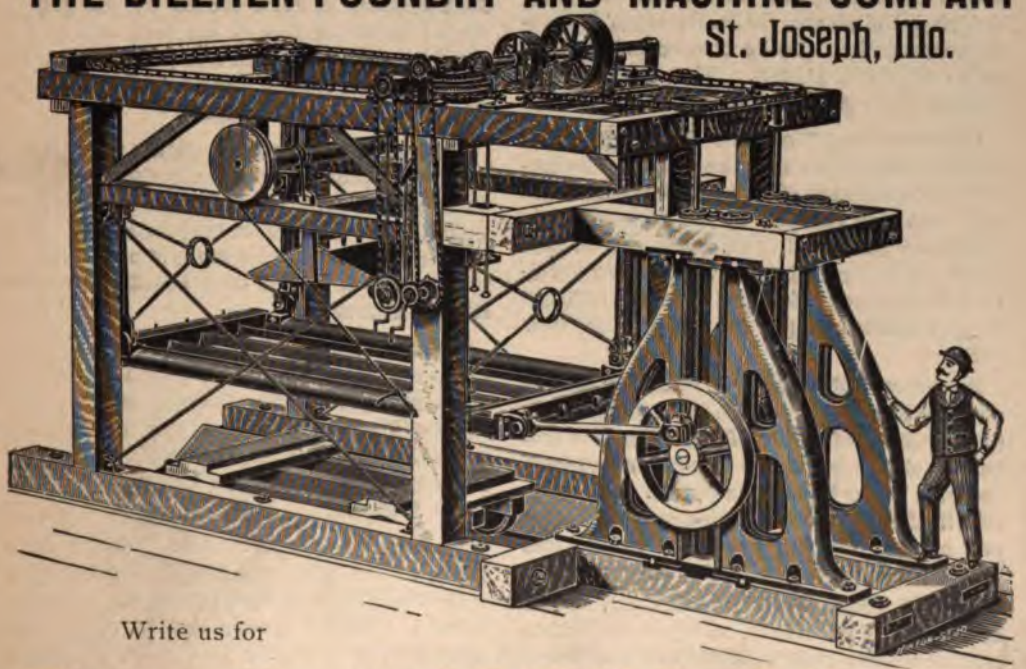
BRANCH OFFICES:
Bowling Green Offices, New York.
422 Seventeenth St., Denver.
11 Calle de Gante, City of Mexico.
73a Queen Victoria St., London, E. C. England.

Gates Iron Works

DEPARTMENT T.
650 Elston Avenue, CHICAGO, ILL.

THE BIELHEN FOUNDRY AND MACHINE COMPANY

St. Joseph, Mo.



Write us for

Stone Saw-Mill Machinery

part in the great struggle. The bill provides for the appointment by the governor of two men, one of whom shall be a Missourian who took part in the battle on the Union side, and the other an ex-Confederate who fought at Shiloh. These men are to pick out a spot near where the Missourians did the most fighting and superintend the erection of the monument.

Tuscola, Mich.—Millington Grand Army post is endeavoring to raise money for the erection of a suitable monument to the memory of the soldiers and sailors buried in that village.

Indianapolis, Ind.—The House has passed the act appropriating $5,000 for a statue of Oliver P. Morton, to be placed in Statuary Hall in the Capitol at Washington.

Marshalltown, Iowa.—Plans have been prepared by Architect J. H. Prescott for the erection of a new church in this city. To be constructed of pressed brick and stone; have furnace heat; gas and electric fixtures; plumbing; plate and cathedral glass, etc. Bids for the erection of same will be received about May 1. Estimated cost, $15,000.

Tullahoma, Tenn.—Plans have been prepared by Architect R. H. Hunt, 8 and 9 Keystone Block, Chattanooga, for the erection of a large church at Tullahoma, for St. Barnabas' Episcopal congregation. To be constructed of stone and cost about $12,000. The pastor, Rev. Charles T. Wright, will give further particulars.

Jefferson City, Mo.—The House March 2 passed a bill authorizing the governor to reappoint a commission of five to sell the land and buildings now occupied by the Missouri State School for the Blind in St. Louis, and to purchase a new site. They are to erect new buildings for the institution and the sum of $20,000 is appropriated to pay for the proposed new site.

Baltimore, Md.—The jail board at its last meeting decided to ask the city council for an appropriation of $35,000 for building the proposed addition for boys. The plans have been accepted by the building inspector. The council will also be asked for an appropriation for putting new heating apparatus in the jail. Warden Bailey can give further information.

Detroit, Mich.—President McVicar, of the Board of Public Works, will give particulars relative to the construction of a handsome stone structure across the river to take the place of the old bridge. He is of the opinion that a stone bridge could be built for about $600,000, and the present bridge could be used for an approach from the head of the island.

English, Ind.—A Monument Association has been organized, with John V. McCoy, President; H. A. Ellsworth, Vice-President; Sam Cummins, Secretary, and James F. Jones, Treasurer; to collect contributions to erect a monument in honor of the late William H. English, in whose honor the town was named.

Barre, Vt.—A monument will probably be erected to the memory of Robert Burns, the Scotch poet.

Fall River, Mass.—Phillip D. Borden, City Engineer, has prepared plans for the proposed viaduct, bridges, etc., to abolish grade crossing within the city limits. The improvement is estimated to cost about $1,500,000.

East St. Louis, Ill.—Henry D. Sexton, George Scaub and John Niemes, of this city, have been granted a license for the incorporation of the East St. Louis & St. Louis Bridge & Construction Co., with a capital stock of $100,000, to construct a bridge across the Mississippi River.

Cincinnati, O.—It is estimated that it will cost about $50,000 to repair the damage to the Eighth street viaduct, caused by the giving way of about 200 feet of the west end of the structure. The accident was probably due to the high water having undermined and generally weakened the foundation.

Quebec, Ont.—Reports state that the Dominion government has promised assistance to the extent of $1,000,000, the Quebec government $500,000, and the Quebec corporation $250,000, on condition that a company is at once formed to construct a bridge over the St. Lawrence River at this city.

Philadelphia, Pa.—The council committee on surveys reported favorably, March 2, on the ordinance appropriating $600,000 and authorizing the director of public works to construct new bridges, and appropriating $50,000 for the commencement of work on the proposed Passyunk bridge.

Norfolk, Va.—Reports state that the New York, Philadelphia and Norfolk Railroad Co. will construct a bridge across the southern branch, in this city, estimated to cost about $85,000. President, A. J. Cassatt, 23 South 15th street, Philadelphia, Pa.

Rock Crusher Economy

THE CHAMPION STEEL ROCK CRUSHER, WITH ELEVATOR AND SCREEN.

There is economy in figuring, if you figure right. Before buying a Rock Crusher do a little figuring, not only as to first cost, but as to cost of operating, and probable cost for repairs.

When you figure don't fail to include the **Champion Crusher** the cheapest crusher on the market to operate. Built in several sizes. Seven to thirty tons per hour capacity.

GOOD ROADS MACHINERY CO.,

Mention STONE. **Kennett Square, Pa.**

Catalogue is free for the asking. It will interest you.

THE PULSOMETER STEAM PUMP

"The Contractor's Friend."

OFTEN IMITATED——NEVER EQUALED.
OVER 20,000 IN USE.

Recent Important Improvements.

The Handiest, Simplest, and Most Efficient Steam Pump for General Mining, Quarrying, Railroad, Irrigating, Drainage, Coal-washing, Tank-filling, Paper Mill, Sewer and Bridge Contractors' Purposes, etc., etc.

Muddy or gritty liquids handled without injury to the Pump.

PULSOMETER STEAM PUMP CO.,

Catalogue on Application. Correspondence Solicited.

135 Greenwich St., - NEW YORK.

NOTES FROM QUARRY AND SHOP.

The stone quarry at Kankakee, Ill., is about worked out and it is proposed to donate it to the state to make an artificial lake for the convenience of the hospital, which is near by.

In California the convicts in the penitentiary are employed in quarrying and crushing stone for roads. The stone is sold for 25 cents a ton loaded on the cars, and the railroads haul it at a less rate, so that roads can be built at the rate of 60 to 75 cents a cubic yard at almost any place in the state.

Lady Henry Somerset is about to erect, in the temperance village of Duckshurst Surrey, a heroic-sized figure representing Jesus, with his hands outstretched. It will be the first statue of Christ erected in a prominent place in any British town or village since the Reformation.

The Casparis stone quarry at King's Creek, O., started up with ninety men after being closed down all winter, according to Supt. Jos. Walsh.

An agreement as to wages and hours of labor for two years has been reached between the Concord, N. H., Granite Manufacturers' Association and the Concord branch of the Granite Cutters' National Union.

Only one marble statue of the human figure with eyelashes is known. It is one of the gems of the Vatican, the Sleeping Ariadne, and was found in 1503.

Pipestone, Minn.—Some time ago an eminent Chicago chemist discovered that the red building stone quarried here contained a goodly per cent. of aluminum, which was easily extracted by an electric process. An agent was at once dispatched to this city to look the quarries over and purchase them if possible and a deal was nearly completed, but was frustrated by a misunderstanding among the Chicago men interested. It has since leaked out that samples of the stone contained by assay a very high percentage of aluminum, and that this was the reason the Chicago men had wanted to purchase the quarries. Local people at once sent samples to noted London assayers, who have just returned a report of analysis that shows from 10.25 to 15.13 per cent. of aluminum.

The bluestone quarrymen of New York anticipate a fair business for the coming season.

Scotchmen are reported to have almost entire control of the stone-cutting industries of New York.

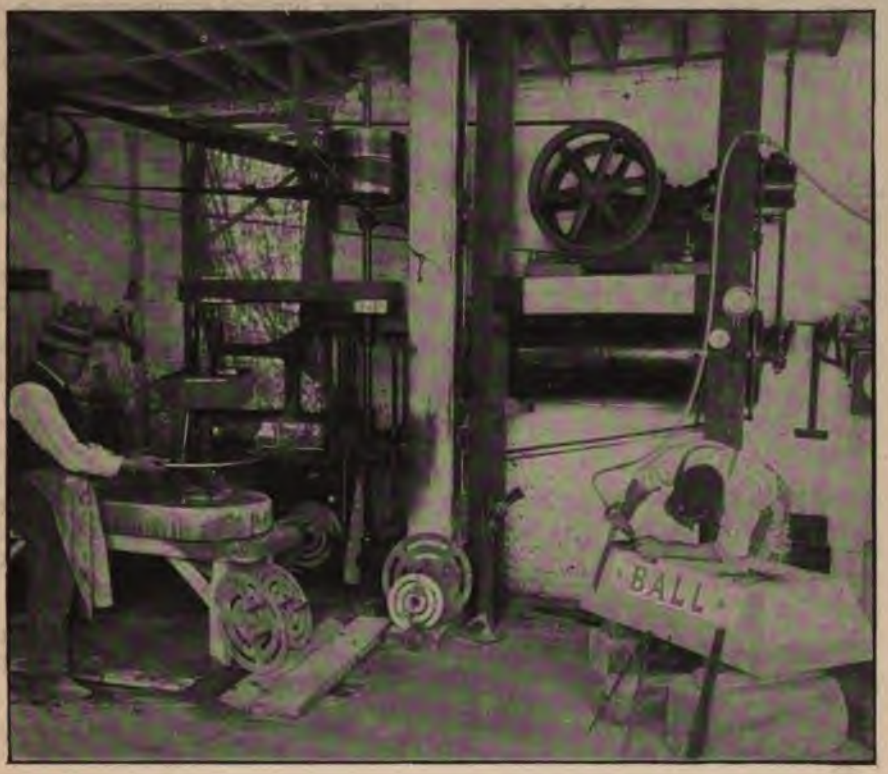
Decatur, Mich.—While blasting in a stone quarry at Jamestown, Ottawa county, the workmen came upon a pocket in the solid rock containing flint instruments unquestionably wrought by human hands. Three of the instruments evidently had been used for hammers, as there are grooves around them by which they were fastened to the handles. Another stone implement was long and had thin elliptical edges. The pocket in the sandstone was a perfect mold for the stone implements, and it is thought the mass of rock was formed around them. The quarry is in the Black river basin, which at no remote period was covered with the waters of Lake Michigan.

The owner of a granite quarry in Frankfort, Me., testified that he sells stumpage for granite at eight cents a cubic yard for dimension stone and at six cents for grout. Grout granite is of irregular shape, and all sizes from a paving stone up. Cost, 60 cents a cubic yard, including stumpage, to get dimension granite from quarry to wharf; 60 to 65 cents a yard for grout.

Air Compressors

and

Pneumatic Tools in the Stone-Worker's Shop Produce This Result



VIEW OF INGERSOLL-SERGEANT COMPRESSOR RUNNING CARVING TOOLS.

USED IN QUARRIES BY

Allegheny Quarries, LANCASTER, OHIO
Michigan Stone & Supply Co., SCOFIELD, MICH.
Booth & Flinn, BLAIRSVILLE, PA.
Casparis Stone Co., etc., KENNETH, IND.

STONE WORKERS

L. L. Manning & Son, PLAINFIELD, N. J.
Bowker, Torrey & Co., BOSTON, MASS.
J. S. Rowe, BEDFORD, IND.
Many Others.

COMPLETE PLANTS FURNISHED.

The INGERSOLL-SERGEANT DRILL CO.

OLD COLONY BUILDING,
CHICAGO.

HAVEMEYER BUILDING,
NEW YORK.

201 CONGRESS STREET,
BOSTON, MASS.

26 SOUTH WATER STREET,
CLEVELAND, O.

ROCK DRILLS. CHANNELERS FOR QUARRYING.

Please mention STONE when you write to advertisers.

Baltimore, Md.—Prosposals for constructing a postoffice building at Fortress Monroe, Virginia, are invited by an advertisement in the Baltimore *Sun*.

Pittsford, Vt.—E. R. Hendee will probably sell another marble quarry from his farm.

San Francisco, Cal.—The South Park Development Company; capital, $10,000,000. By Geo. Montgomery, J. E. Langford, Geo. R. Wells, Chas. H. Fish and C. B. Fleming.

Chicago, Ill.—The Chas. W. Gindele Company; capital, $20,000; contracting. By Howard H. Carter, Will H. Clark and Ira C. Wood.

George White & Co., of Newark, N. J., to quarry and deal in stone for building, decorative, monumental and manufacturing purposes, with a capital stock of $1,000. The incorporators are George H. Lambert, Frances B. Lambert and Joseph K. Franks, all of Newark.

Hanging Rock Sandstone Company, Chicago, Ill.; capital stock, $100,000. To deal in stone, terra cotta, brick, tile and coal. Incorporators, Jens Jensen, John V. McAdam, Benjamin Crawford, John C. Regan.

Sandstone, Minn.—Benjamin Davenport, who is interested in the Kettle River sandstone quarries, says reports of a strike at the quarries are untrue. "I have seen Dr. O'Brien, who left the quarries this morning," said Mr. Davenport, "and he says there is no strike there and has not been any. The men have not been paid regularly on account of the delay of the city of Minneapolis in paying the contractors, but they have kept at work all the time, and will be paid in full." Joseph Rioux, who left the quarries Wednesday morning, also says that there has been no strike.

Concord, N. H.—The recent agreement between the granite-cutters' union in this city and the granite manufacturers fixed the minimum rate per hour at 29½ cents—not 24½ cents as stated erroneously in some of the papers.

Boston, Mass.—A new joint commodity tariff on marble and granite has just been issued on the Fitchburg line, and its western connections, effective Feb. 15, from Boston to Chicago, and, on the same basis to other Western points west of the western termini of the trunk lines, by all rail fast lines. The new rate is: Fourth class, 24 cents; fifth class, 21 cents; sixth class, 17 cents. The rate expires March 31.

Concord, N. H.—W. S. Tupper, foreman at the New England granite quarry, No. 1, has a stone quarried 184 feet long, 30 feet wide and 15 feet thick, containing 82,000 cubic feet, first-rate stock.

Galveston, Tex.—Recker, Lee & Co. have shipped to their new sandstone quarries, recently purchased in Mills county, the first car of machinery, derricks, tools, etc., for track laying and general work.

Milford, N. H.—The Milford Granite Company paid 18 per cent. dividends last year.

The marble industry in Pickens county, Georgia, is prosperous, all the companies running on full time and paying their hands promptly. Prof. Fuchs, of New York, a noted sculptor, who has developed quarries in Italy and Tyrol, spent a few days recently in prospecting and buying property in the Long Swamp Valley in the region of the Piedmont and Southern Marble Company's property. He has bought to the amount of $30,000.

Centralja, Mo., has a line out for a tombstone factory and the citizens have the grave question under consideration.

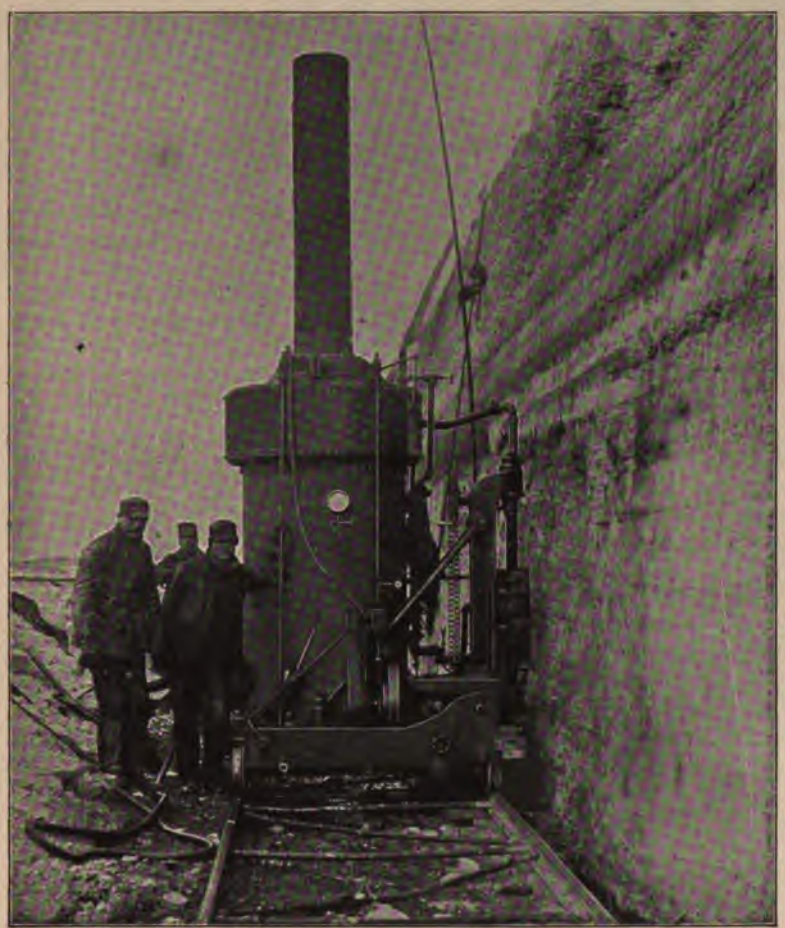
Middlefield, Mass.—George Gibson has begun to get out stone in Dr. Lucas' quarry, in Middlefield, where there is an unlimited supply o superior granite, which has been tested and acknowledged. If the B. & A. R. R. will give him a switch to the quarry there will be work for a number of men. This quarry lies between Becket and Middlefield on the east side of the railroad.

Ft. Dodge, Iowa.—A new quarry has been opened on the McCauley farm, about two miles up the river. Ole Jacobson and W. F. Bucholz are operating it.

Sedalia, Mo.—The Great Western Marble Company held a meeting recently in their new office in the Hoffman Building. Considerable new machinery was ordered for their quarries at Bunch, I. T., which will be put in place at once. Those interested in the quarry have known from the beginning that their investment would be a good one, and it was with

SULLIVAN

Channelers and Gadders!



THE SULLIVAN CARRIAGE CHANNELER USED ON DRAINAGE CANAL

55	Sullivan	Channelers	in use	on Chicago Drainage Canal.
80	"	"	"	in Vermont Marble Quarries.
27	"	"	"	in Southern Marble Quarries.
20	"	"	"	in Sandstone and Limestone Quarries.
15	"	"	"	in New York Marble Quarries.

ROCK DRILLS of all sizes and for all purposes. DIAMOND CORE DRILLS for testing mineral or quarry lands

Sullivan Machinery Co.,

Main Office, 54 to 60 N. Clinton St., CHICAGO. Eastern Office & Works, CLAREMONT, N. H.

Please mention STONE when you write to advertisers.

much satisfaction that several good orders for marble were reported to be delivered as soon as possible. One of the largest orders was from Chicago for a front for one of that city's famous skyscrapers.

Baltimore, Md.—Orville T. Gosnell and Andrew M. Kirkpatrick, trading as the Star Granite Company, have applied for the benefit of the insolvent law. Their assets are stated to consist of horses and cattle, quarry appliances and cut stone, and their liabilities are estimated at $4,750. Mr. W. F. Mitchell is counsel for the applicants.

Hartford, Conn.—Hiram R. Mills, who as a committee heard the cause of the National Granite Company against August L. Langefeld and P. H. Conrad, has filed his report with the clerk of the Superior Court. He finds that the defendants are indebted to the plaintiff to the amount of $997.22.

Dover, Me.—The first meeting of the creditors of the Moosehead Lake Slate Company took place March 6. Roswell Whitney, of Providence, R. I., and J. F. Sprague, Esq., of Monson were appointed assignees.

New York City.—Warren S. Burt has been appointed receiver in supplementary proceedings for George W. White, dealer in stone at No. 160 Fifth avenue, by Judge McCarthy, of the City Court, on the application of the Stinesville & Bloomington Stone Company. It is claimed that Mr. White transferred to Pauline B. White $750 cash and four accounts, one of the latter being for $5,600, and the receiver is authorized to bring suit against her to recover the money and to set aside the assignment of accounts. Mr. White has been in the stone line for the past ten years.

Montpelier, Vt.—Charles H. More & Co. have opened their granite manufacturing works, after a shut-down since September.

Quincy, Mass.—It is rumored that the granite manufacturers will combine to maintain a fixed price on monumental work. It is believed that a combination to control prices will restore business prosperity.

Westerly, R. I.—Some two years ago Mrs. Mary Y. Smith, of Limerock, purchased a gravestone of the Smith Granite Company, of this village, which was placed upon her husband's grave. She claims that it was purchased on account of her late husband's estate, but the bill was made out to her. The company sued her, but failed to obtain a verdict. During the trial the company had maintained that the stone was not purchased on account of the husband's estate. Therefore, when it failed to win against the widow, it replevined the gravestone. The Appellate Court recently dismissed the replevin suit, because the mistake was made of bringing the suit in one District Court and replevying the stone just over the line in the next town, which is in another district. Further than that, it is alleged that the stone was real estate, and could not be replevined unless somebody first knocked it over and dislodged it from the place where it stood. Feb. 23 Mrs. Smith began a suit for trespass against the company, placing the damage at $1,000 and charging the company with having illegally entered upon her burial lot in order to remove the stone. It is a novel suit in every way.

Boston, Mass.—An attempt was made recently to induce eight marble cutters to work for granite manufacturer Lyons. The men, who were Italians, were suspicious that something was amiss as soon as they got in sight of the yard. They were finally informed that a strike was in progress and they then refused.

Kaukauna, Wis.—The partnership of M. J. Campbell, H. R. Falk and E. N. Raymond, under the firm name of Fox River Marble and Granite Works, has been dissolved, Mr. E. N. Raymond having withdrawn from the firm. The business will be continued by Messrs. M. J. Campbell and H. R. Falk who will pay and collect all the bills of the firm, fill all the orders thus far taken, and hope their many friends and patrons will continue to favor them with their patronage.

Poultney, Vt.—E. L. Goodrich, formerly of the firm of Barrett & Goodrich, has bought Charles Stevens & Co.'s business in Fair Haven. M. J. Horton has bought the J. J. Owens quarry property in South Poultney for $1,000.

Hot Springs, S. D.—It is rumored that the Elm Creek stone quarry is soon to be sold.

Milwaukee, Wis.—The Bay City Brick, Stone, Lime and Cement Company organizes with a capital stock of $100,000, and will manufacture brick, lime and cement, and quarry stone. The incorporators are J. M. Vorhees, C. F. Leimkuchler, E. L. Hooker and W. H. Boettcher.

Milwaukee, Wis.—The Great Western Construction Company is organized with a capital

THE WARDWELL

Steam Stone Channeling AND Quarrying Machine

The original and first Stone-Channeling machine ever invented. Will pay for itself in a short time in the reduced cost of getting out stone. *Has no equal for efficiency and economy of operation.*

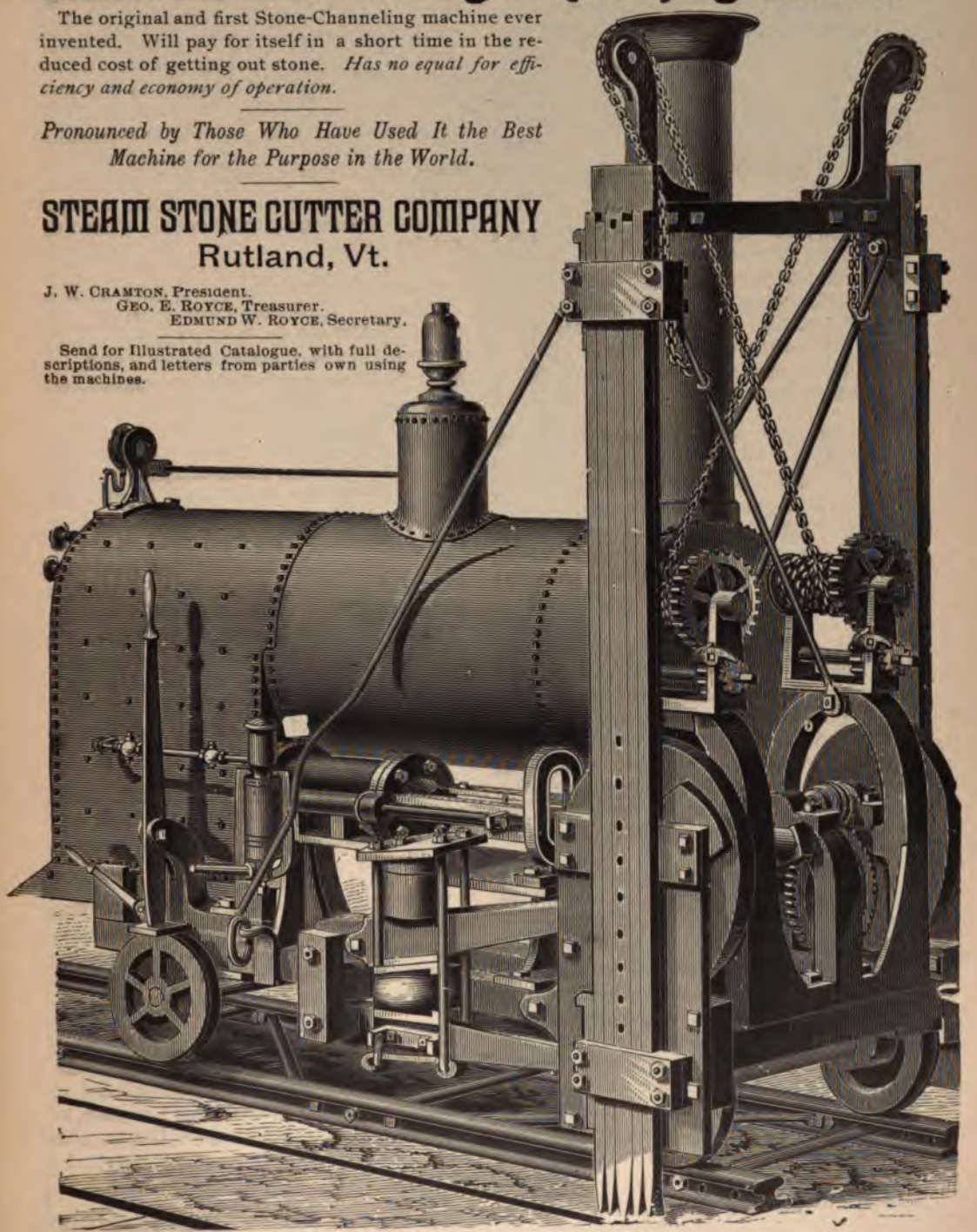
Pronounced by Those Who Have Used It the Best Machine for the Purpose in the World.

STEAM STONE CUTTER COMPANY

Rutland, Vt.

J. W. CRAMTON, President.
GEO. E. ROYCE, Treasurer.
EDMUND W. ROYCE, Secretary.

Send for Illustrated Catalogue, with full descriptions, and letters from parties own using the machines.



stock of $100,000, and will build bridges and construct buildings. The incorporators are C. F. Leimkuchler, William A. Carson and J. W. Palmer.

The big plant of the Middle Branch, Portland and Diamond Cement Company, ten miles north of Canton, Ohio, burned out lately causing a loss of $200,000, and throwing 100 men out of work.

Topeka, Kan.—L. W. Lewis, of Emporia, a well-known railroad contractor of Kansas, has been awarded the contract for constructing the stone work and all masonry on the extension of the Kansas City, Pittsburg and Gulf railroad out of Kansas City north. It will be extended through Missouri and Iowa. Work will be commenced immediately.

Lockport, N. Y.—It is reported that Chas. Whitmore, the contractor and quarryman, is about to receive an order for 500,000 cords of stone for use on the Buffalo breakwater. This will mean a great deal for Lockport. To fill this order promptly, the quarrying, dressing and loading of the stone would require the employment of 200 or 300 men all summer.

George A. Douglas, Western manager for the New England Granite Works, recently secured the contract for a memorial of the late Matthew Addy, president of the Addyston Pipe and Steel company, of Ohio. It is to be cut of Westerly granite, and will cost $7,000. A memorial to Joseph Horne, of Pittsburg, Pa., to cost $8,000 and to be cut in white Westerly, has been secured by Mr. Douglas.

The Illinois commission appointed to mark the positions of Illinois troops on Southern battlefields have awarded Col. J. S. Culver, of Springfield, the contract for erecting the monuments and markers which will be placed on Mission Ridge. The monuments will be fashioned after those which the commission built on the field of Chickamauga, and the markers will also be of the pattern previously used. It will require forty monuments to show the positions of the various bodies of Illinois troops and, in addition to these, there will be a large number of small markers. The cost of the monuments and markers, under the conrract with Col. Culver, will aggregate about $23,000.

St. Paul, Minn.—Carl Kropp, who has the contract for the improvements to the Stearns county court house, has received bids for the stone to enter the new portion of the building. Four bids were received, as follows: Robert Ashworth & Co., $838; Anderson & Co. and Noren & Son, $800.65; Alex. Cameron, $915; Walter Arnold, $1,035. Ashworth & Company's bid is for the stone as per plans and specifications, and that of Anderson & Co. covers but seventy cords of rubble, whereas Mr. Kropp's estimate is for eighty-three cords. Ashworth got the contract.

Macon, Ga.—The Georgia Quincy Granite Company, of Macon, has secured the contract to furnish $187,000 worth of stone for the government jetty work in Cumberland Sound. It will take three years to finish the contract, furnishing tweuty car loads of stone daily.

Chicago, Ill.—Dolese & Shepard and the Chicago and Naperville Stone Company have decided to consolidate as Dolese, Shepard & Co. The capital will be about $500,000. It is reported this will involve the investment of considerable capital by men not connected with either firm. All contracts held by either of the parties to the deal will be carried out by the new firm, which will continue to operate the stone-crushing plants now in use at Naperville and Hawthorne. The coalition is said to result in the largest concern of the kind in the world contracting for and dealing in crushed stone and concrete work.

Tunkhannock, Pa.—The extensive stone quarries of Col. N. A. McKown, a little way out of the borough, have been leased by Theodore Streeter.

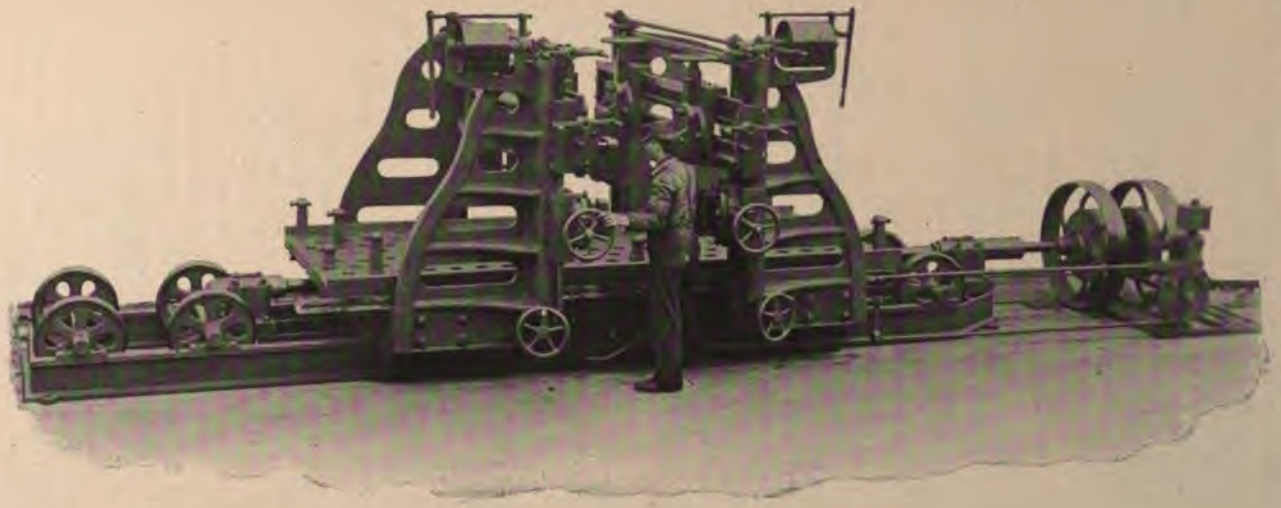
Washington, D. C.—Bailey, Koerner & Co., of Louisville, Ky., have been awarded the contract for the construction of the addition to the Government building at Little Rock, Ark., at their bid of $68,025.

Eureka, Ill.—The Woodford county board of supervisors on March 25 let the contract for the erection of the new court house in this city to the James Davault Construction Company, of Columbus, O., their bid being $58,100. It is to be of buff Bedford limestone and absolutely fireproof. To be two-story and basement.

War has been declared on the Bricklayers' and Stonemasons' union by the Journeymen

Double and Single Head Stone Planers a Specialty.

Gang Saws.



Rubbing Beds, Etc.

F. R. PATCH MFG. CO.

Send for Catalogue B.
Mention STONE.

RUTLAND, VERMONT, U. S. A.

Please mention STONE when you write to advertisers.

XX

Stone-cutters' association, of Chicago. The war grew out of the attitude the bricklayers took in the strike at the new power-house on Market street and on the new elevated railway loop. At that time the bricklayers remained at work and performed not only their own work, but that of stonemasons and hodcarriers. The Stone-cutters' association has given the right to its members to engage as bricklayers if they so desire. All members of the Bricklayers' union are to be treated as non-union men in the future.

One hundred granite-cutters, members of the New England Granite-cutters' union who were employed at John Beatty's quarries, at Leete's Island, Conn., went on strike March 23. The strike is the result of a demand made by the granite-cutters in Beaty's employ for an increase in wages. The cutters have been receiving 25 cents a foot for what is known as face work. The cutters asked for an increase in this rate. Beatty refused to grant the increase, inasmuch as it was not consistent with the terms of the agreement between the manufacturers and employes, namely, that three months' notice shall be given.

East Lancaster, O.—Mr. D. DeBartoli has opened a stone quarry just south of this city, near the C. H. V. & T. R'y.

Berwyn, Pa.—William Cudlipp, an energetic young business man of West Chester, will open out a marble yard at Berwyn, about the first of April. Mr. Cudlipp is a competent workman and has considerable business ability. He will no doubt prosper in his new undertaking.

Schofield, Mich.—One hundred and fifty extra men will be put to work in the stone quarries at Schofield.

Bangor, Mich., has a much needed new marble works, just established by E. C. Millen. It is the first enterprise of the kind for the town.

Marion, Ind.—Bob Thomas will open up a stone quarry in North Marion. The work of stripping the dirt will be commenced just as soon as the weather will permit.

Bainbridge, O.—Charles Q. Davis and W. R. Harper, Jr., a banker of Ottawa, O., have arrived here and are arranging for the opening of three stone quarries, the products of which will be shipped to northern Ohio for building and railroad purposes. The opening of these quarries will give employment to fifty to one hundred men.

New York, N. Y.—Elbridge Walcott, a well-known business man of this city, died at his home March 25. He was president of the Mycenian Marble Co.

American Stone and Conduit Company, at Chicago; capital stock, $100,000; to manufacture conduits, etc.; incorporators, Robert W. Francis, 575 Rookery, Frank E. Mariner, D. A. Kimbark and E. N. Reaser.

St. Louis, Mo.—The St. Louis Novaculite Company; capital stock, $3,600; Walter S. Townsend, J. H, August Meyer and Wm. E. Fisse. The corporation will do a street paving business and handle building materials.

Buffalo, N. Y.—The supervising architect of the Treasury Department, Wm. Martin Aiken, Washington, D. C., has awarded to John Pierce, of New York City, contractor for the superstructure, the contract for an additional story to the United States postoffice building at Buffalo, in amount of $133,000.

M. Monson has leased the Jamison stone quarry at Biggsville, Ill.

Dongola, Ill.—Andrew Beggs last week sold his interest in the marble shop to H. N. Keller.

Vinalhaven, Me.—At a meeting of the Fox Island Granite Company, held March 3, T. J. Lyons, L. W. Smith, L. M. Treat, Alex. Petrie and David Walsh were elected directors. March 5 L. W. Smith was elected president, L. M. Treat, vice president, and T. J. Lyons, secretary and treasurer.

Cleveland, O.—The Cleveland Stone Company has filed suit against Contractor Fred Andres, seeking to recover $614.14 for goods sold and delivered. The balance, the complaint states, is due for stone alleged to have been used in the erection of the new city hall.

Syracuse, N. Y.—Hughes Bros. & Bangs have made an additional purchase of property adjoining their quarries near Bellevue, Brandy-

STONE and MINING MACHINERY.

Stamp Mills,
Concentrating Machinery,
Smelting Machinery,
Lixivating Machinery,
Cyanide Machinery,
Rock Breakers,
Engines and Boilers

Traveling Cranes,
Derricks,
Derrick Powers,
Planers,
Lathes,
Wire Rope and Fittings,
Rubbing Beds.

Manufactured by

H. H. SCOVILLE & CO.,

CHICAGO,
250-252-254 South Clinton Street.

TELEPHONE MAIN 4805.

LINCOLN IRON WORKS

Rutland, Vermont.

New York Office: 803 Havemeyer Bldg.

Manufacturers of

STONE-WORKING MACHINERY

Gang Saws, Diamond Saws, Planers, Rubbing Beds, Derricks, Block Cars, Tile Machines, Saw Dogs, Hoisting Powers, both Steam and Belt.

Estimates furnished on complete Plants, including Buildings, Engines, Boilers, etc.

Arithmetic for Stone Dealers.

Calculations Made Easy,
Errors Avoided,
Time and Labor Saved by

Ropp's
COMMERCIAL
CALCULATOR.

The most useful, complete and *practical* work on Figures ever published. Specially useful to stone, marble, granite and slate dealers and quarrymen. Nearly every problem in business *already figured out.* Arithmetic made so plain by *original*, short and simple methods, that a child can comprehend it. Worth its weight in gold to young and old. Nearly half a million copies sold. Accompanied by account book, silicate slate, pocket, etc. Bound in elegant leather, pocket size. Address

THE D. H. RANCK PUB. CO., 358 Dearborn St., Chicago.

Sent by Mail on Receipt of Price, $1.

wine Hundred. The addition is about an acre in extent and is a triangular piece bounded by the company's present property, Stony creek and the Philadelphia turnpike.

Washington, D. C.—A suit was filed by the Vermont Marble Company against William S. Winfree, who constructed the amusement hall at the Soldiers' Home, and George A. Sheehan, who became trustee for Winfree, was named as a defendant. The complaint set up that the contractor received final payment from the government in the sum amounting to something like $19,000, which was placed in Mr. Sheehan's hands to divide pro rata among the contractor's creditors. The Vermont Marble Company claimed the sum of $19,535 as the balance due the company upon a contract to furnish about $35,000 worth of marble for Amusement Hall. The suit has now been dismissed on the grounds of the disinterested part taken by Mr. Sheehan.

Duluth, Minn.—Sheriff Sargent sold at public auction on the premises on Lake avenue south, the stock of monuments, book accounts and bills receivable of the Duluth Monumental Company to E. A. Tyler for $462. There were about 125 monuments and pieces of cut stone and the bills receivable and book accounts were of a face value of $4,500.

Montello, Wis.—The sale of most of the personal property of the Berlin & Montello Granite Company, advertised to come off March 24, has been postponed, and it is understood that the company will settle all claims in full and go on with the work.

Kokomo, Ind.—F. McKeown, the monument man, has moved to Tipton from Kokomo, having bought the property of Mel Justus.

The White River Quarry Company, Bedford, Ind., is making arrangements for opening up the Tanyard quarry for a six or eight months' run. They have secured a big contract in the East.

Rock Rapids, Iowa.—March 21 the river here reached the high water mark of 1882. One hundred and eighty feet of the new steel bridge were taken out, leaving only the main span. The bridge two miles north of here across the Rock river went out March 20. The Omaha Railway bridge across the river is gone. Supervisor Roach says that $50,000 will hardly cover the damage done to wagon bridges in the county.

Lima, O.—The Dayton Northern Railroad Company on March 20 received bids for the construction of a handsome new sandstone depot building at Wayne street, and the C., H. & D. and L. E, & W. railroads, but have decided to make some changes in the arrangement of the structure and rejected all. The depot will be two stories in height, tile roof, and of the most modern and improved pattern.

Boston, Mass.—J. Reed Whipple, lessee add proprietor of Young's hotel and the Parker house in this city, is building a hotel at the corner of Tremont and Boylston streets, Boston, known as the Touraine. It is to cost when completed $2,500,000. This hotel is on one of the most valuable corners of the city.

Detroit, Mich.—A light-gray granite, furnished by the Maine and New Hampshire Granite Company, will be used in the new county building. It is the same stone as that of which the Grant Memorial in New York City is constructed and comes from the North Jay quarry in Cumberland county, Maine. Quarrying will commence at once.

Harrisburg, Pa.—The stone breaking at the Cameron street quarries, under the auspices of the Harrisburg Benevolent Association, ended this week, the amount of stone that will be covered in the city's appropriation of $3,000 being ready for delivery. This stone was broken for the city's use, the money being advanced by public spirited men and was the means of giving many weeks' work to hundreds of idle men.

The motion of the American Pneumatic Tool Company to withdraw their suits against certain defendants without prejudice to the complainants has been denied by a recent trial judge, and an early termination of the points at issue should now be reached. Everything tends to favor those opposed to the American Company.

Lawrence, Kan.—Strahn & Nelson, marble works. Fred Strahn reported to have released mechanic's lien for $417.

Carthage, Mo.—W. A. Griffith, marble and stone, reported to have released chattel mortgage for $877.

LIDGERWOOD
Hoisting Engines

Combining All the Latest Improvements,

Also

SUSPENSION CABLEWAYS

For Quarries and General Hoisting Purposes.

LIDGERWOOD MFG. CO.,

96 LIBERTY STREET,

NEW YORK.

26 South Water St., Cleveland, O.
Old Colony Bldg., Van Buren and Dearborn Sts., Chicago.
197-203 Congress St., Boston.
40 North First St., Portland, Ore.
610 North Fourth St., St. Louis.
92-94 First Ave., Pittsburgh, Pa.
15 North 7th St., Philadelphia.
21-23 Fremont St., San Francisco.

SALES AGENTS:

FRAZER & CHALMERS, Salt Lake City, Utah, and Helena Montana.
HENDRIE & BOLTHOFF MFG. CO. Denver, Col.
ROBINSON & CARY, St. Paul, Minn.

THE NEW ALBANY M'F'G. CO.

Manufacturers of

Steam and Electric Traveling Cranes for any purpose.

Our larger cranes are Especially adapted to

STONE SAW MILL USE.

The smaller electric cranes are very economical for *Storage Yards and Cutting Sheds* in cities where current can be had (by meter) from public power station.

We build all sizes, from *three to twenty-five tons capacity*, and *any width of span* up to 60 feet.

DON'T BUY UNTIL YOU GET OUR PRICES.

We also build

WARDWELL CHANNELERS, STONE PLANERS, SCREW FEED SAW GANGS, HEAVY POWER HOISTS AND DERRICK IRONS.

THE NEW ALBANY MFG. CO., New Albany, Ind.

St. Joseph, Mo.—J. J. McGinnis, marble, etc., succeeded by McGinnis & Kell.

Wareham, Mass.—Frank Ryder has recently purchased an interest in the marble business of Robert C. Randall.

J. E. Bateman has disposed of a one-half interest in the Monticello (Iowa) Marble Works to F. E. Millholen, a practical marble and granite cutter from Dubuque.

Detroit, Mich.—Smith & McDonald, stone contractors of this city, have dissolved partnership—John E. Smith continuing.

Maysville, Ky.—M. K. Gilmore, marble, etc., reported to have given real estate mortgage for $1,000.

Berlin, Wis.—The plant of the Berlin and Montello Granite Company in this city was attached March 1st by seven different parties from Montello and this city for about $1,200. D. W. McNamara, an attorney from Portage one day lately closed the works of the Berlin and Montello, and levied attachments for large claimants on the company's plant in this city completely shutting out the laboring men of this place who hold claims against the company to the extent of $13,000.

Elyria, O.—Herman Kunitz has filed his petition in common pleas court against the Grafton Stone Company, asking for $15,000 damages for injuries received while working in their quarry March 18, 1893. While lifting a stone a wire broke and he was seriously injured.

Waverly, O.—The affairs of the Waverly Stone Company are to be settled up according to law, and another attempt made to place the enterprise on a paying basis. The company made an assignment several days ago and David Lorbach, who was appointed as receiver, will at once proceed to settle up the business as quickly as possible.

Joliet, Ill.—Theodore Clark, of the Clark Granite Company, has left town. Four years ago he married Miss Annie Smith. It is said that a few weeks ago he induced his wife to mortgage her two farms in Manhattan, and took the money, amounting to $8,000, to Chicago, where he lost it on the board of trade. He had, it is alleged, previously mortgaged all his personal property and the stock of his marble works, and induced his mother-in-law to let him have considerable money. His wife and creditors are desirous to know where he is.

GEARED LOCOMOTIVES.
HOISTING ENGINES.
TRAVELING DERRICK CARS.
DERRICK IRONS
ETC

MANUFACTURED BY
THE JOHN F. BYERS MACHINE CO
RAVENNA, OHIO. U.S.A

HOISTING, MINING, BRIDGE ERECTING,

Dock Building.
Pile Driving.
Coal Hoisting and
Quarry Engines

of any power, Sugar Cane transferring engines, transferring machines for depositing cane from car to carrier, with my improved Patent Friction Drums with or without Boilers. Any amount of reference given. Established 1870. Send for Catalogue.

J. S. MUNDY, Newark, N. J. 1744 Market St., Philadelphia, Pa., 22 Light-st. Baltimore, Md., 117 Water-st., Pittsburgh, Pa., 349 S. Jefferson-st., Chicago, Ill., 715 N. Second-st., St Louis Mo., 34 Fremont St., San Francisco, Cal., 85 Front-st., Portland Ore., 218 Congress-st., Boston, Mass.

I SEE YOU'RE BACK

from a trip over the

MONON ROUTE

Solid vestibuled trains Daily, heated by steam, illuminated by Pintsch light,

BETWEEN

CHICAGO
INDIAN'POLIS
CINCINNATI
LOUISVILLE
And the SOUTH.

Only line to

West Baden and French Lick Springs,

The Carlsbad of America.

W. H. McDoel, V. P. and Gen. Mgr.
Frank J. Reed, Gen. Pass. Agt.

City Ticket Office,
232 CLARK STREET, CHICAGO.

HOISTING MACHINERY FOR QUARRYING,

Mining, Coal Handling, Pile Driving, Bridge Building, Log Hauling, and for General Contractors' Use.

Send for **Illustrated Catalogue** giving full description, etc.

CORRESPONDENCE SOLICITED.

Lambert Hoisting Engine Co.

117-123 Poinier Street.

Newark, N. J.

Salesrooms, 143 LIBERTY ST, NEW YORK.

Improved Electric Hoists, single and double, Patent Friction Drum, compound, geared with brakes and reversible for general Hoisting, Mining Purposes and Suspension Cableways. . . .

Derricks and Hoisting Machines

FOR QUARRYMEN AND CONTRACTORS.

SEND FOR CATALOGUE.

Steam Hoisting Engines.
Horse Power Hoisters.
Hand Power Hoisters.
Derricks.
Derrick Irons.
Sheaves and Tackle Blocks.
Rooter Plows.
Centrifugal Pumps.

Dobbie Foundry and Machine Co.,

NIAGARA FALLS, N. Y.

NEW YORK OFFICE:—38 Dey St.

$150 CASH, and **$200** in finished Granite Monument, or Dimension Stone,

will take in exchange a

$400 New Piano

One of the most popular and highest grade instruments made. Still in wareroom. Address

TRADER, care STONE.

Pittsburgh, Pa.—Williams Brick and Stone Company reported to have given execution for $10,000.

Salem, Mass.—In the cases of Rion vs. Rockport Granite Company, and Levique vs. State, actions to recover damages for personal injuries from the explosion of a can of powder from alleged carelessness of defendant's agents, the jury returned a verdict of $2,000 for Rion and $250 for Levique. The case goes up on exceptions.

Kingston, N. Y.—The case of Julius Osterhoudt vs. The Union Bluestone Company and others, an action which arose out of dealings of the bluestone combination which was in existence several years ago, and in which many hearings were had before Judge Arthur Tompkins as referee, has been settled.

Wind Gap, Pa.—The real estate and personal property of the Acme Slate Company will be sold at public sale by the assignee, John W. Underhill, on Monday, April 5, at 1 o'clock. The sale will take place on the premises.

Oak Hill, Pa.—John Walters has purchased the John Burton stone quarry. Andrew Burton has leased the Taylor stone quarry for the coming season.

Cincinnati, O.—Walter Graveson, who has a stone yard on Hannibal street, gave a chattel mortgage to Isaac Graveson for $9,300 recently. The mortgage covers all of the tools and stone in the stone yard.

Manchester, N. H.—The former interest of R. S. Dickey in the granite and marble business of the firm of Lamprey & Dickey, has been purchased by Bela S. Keniston.

Gloucester, Mass.—The quarry and appliances of the Pigeon Cove Co-operative Paving Company were sold recently by John H. Caswell, auctioneer, by order of the assignees. The property was purchased by Gustaf Johnson for $3,515, that is, about $200 above the mortgage and taxes due.

St. Cloud, Mich.—It is learned here that the old plant of the Standard Granite Company will be operated here this season by F. W. Ladd, formerly of Rockville. The plant is one of the best in this section, having several large polishing machines, as well as column cutters. If operated, it will give work to several skilled workmen.

Hawley's Patent Sand Feed

Is used by all the leading firms—saws faster and better than any other sand-feed. More gangs using our feed than any other. Easily kept in order. Also many gangs working satisfactorily, using crushed steel. Can give best of references.

Orders solicited.

E. J. & C. H. HAWLEY,
Manchester, Vt.

SPIRAL

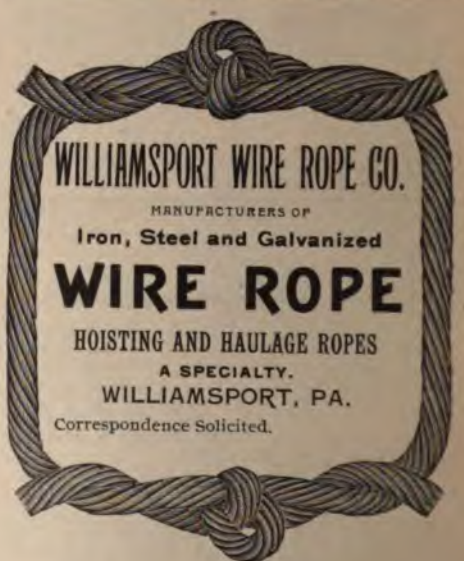
Sand Pump

For Feeding Sand, Steel or Shot for

SAWING STONE.

Of all Kinds. Does More Sawing, Uses Less Sand and Water, Requires Less Power and Repairs than any other. Runs only 20 revolutions per minute Pays for itself in Six Months.

FRENIER & LeBLANC, Rutland, Vt.



Try

ASHBURTON MARBLE

As a Decorative Material.

COLOR:

Dark grayish purple ground, interlaced with a net work of red and white veins.

CAN BE OBTAINED IN BLOCKS OF LARGE SIZE.
TAKES A BEAUTIFUL POLISH.

It is quarried in Devonshire and shipped F. O. B. Bristol, by

ARTHUR LEE & BROS., LTD.,

Marble and Granite Merchants ....

BRISTOL, - - ENGLAND.

Chicago, Ill.—The Sterling Pressed Brick and Stone Company, at Chicago, capital stock, $50,000 incorporators, Charles W. Culliton, John A Clippinger and G. W. Austin.

Middle Granville, N. Y.—The National Red Slate Company; for dealing in slate of all kinds and in lands for quarrying; capital, $30,000; directors, Benjamin Williams, Garner B. Williams, David B. Williams, Samuel F. Barry, and Edward Willis, all of Middle Granville.

Concord, N. H.—The Penacook Manufacturing Company, with a capital not to exceed $100,000, has been incorporated under the general laws. Among the incorporators are John A. and Benjamin L. Blackwood of this city.

Massillon, O.—The buildings of the Massillon Sand and Stone Company have been completely destroyed by fire. The insurance amounts to but $5,000, and the loss is at least twice that amount.

Gloucester, Mass.—A discovery of black granite has been made at the granite quarries at Bay View.

Eatonton, Ala.—Much interest is felt at Eatonton in the establishment of quarries on the newly discovered granite beds of Putnam, on the lands of W. W. Lynch and Mrs. H. V. Marshall. The beds have been recently examined by an expert geologist and pronounced to be the finest vein in America, save one in Vermont, and the supply inexhaustible. T. L. McCarthy, of Lithonia, has leased the Lynch lands, and Venable Bros., of Atlanta, are trading for the Marshall lands lying along the Little river adjoining the old cotton factory site. The Venables will use the Putnam granite in filling their government contract at Fort Tybee.

Lanark, Ill.—J. T. Valentine and George W. Cheeseman will run the stone quarry west of the mill this season, known as John Brown's old quarry. It contains excellent stone for all purposes.

Greensburg, Ind.—S. A. Hollensbe has purchased what is known as the Patterson quarry, near Westport. He reports the outlook as flattering for a good business this season.

Lehigh Gap, Pa.—Col. John Craig is interested in monument sites to mark the Pennsylvania soldiers dead at Lookout Mountain, Chickamauga and Missionary Ridge battlefield in Georgia.

THE CONCORD
(Jenny Lind)
Polishing Machine.
MANUFACTURED ONLY BY THE
CONCORD AXLE CO.,
PENACOOK, N. H.
Send for Circular and Price-List.

QUARRY PUMPS.

CHEAPEST. HANDIEST. SIMPLEST. PUMPS.
Handling Dirty, Gritty and Sandy Liquids, without Wear, Oil or Care. Pumping outfits for Contractors, Mining, Irrigating, Railroad, Quarry, Drainage and Manufacturing purposes. Second-hand Engines, Boilers, Pumps, and other Machinery always on hand. Exchanging.
MASLINS, 165-167 First St., Jersey City, N.J.

VANDUZEN STEAM JET PUMP
THE BEST IN THE WORLD.
Pumps Any Kind of Liquid.
Always in Order, never Clogs nor freezes. Every Pump Guaranteed.
10 SIZES.
200 to 12000 Gallons per Hour.
Cost $7 to $75 each. Address
THE E. W. VANDUZEN CO.,
102 to 108 E. Second St., Cincinnati, O.

N. W. GODFREY,
Miner and Shipper of Silica,
Washed and Screened.
THOMAS & ECKERSON, AGENTS.
New York Office, 33 and 35 West Thirtieth Street.

Let Us Figure

On the illustrations for your next catalog. We don't claim to do the cheapest work, *measured by price alone*, but there are other considerations. You can't afford to misrepresent your goods with poor cuts.

We claim to know how machinery cuts should be made, and we have the talent and the facilities for making them. Before you close your next contract better let us show you examples of our work.

ILLINOIS ENGRAVING CO.,

350 Dearborn St., CHICAGO.

Tel. Harrison 499.

Not **THE BEST BOOK** that could be made, but

THE BEST BOOK

that is now in print to help

Quarrymen, Stone Contractors, Stone Dealers and Stone Cutter

to get at the *Cubical Contents* of any block of stone that can be measured by a foot rule.

NASH'S EXPEDITIOUS MEASURER.

These firms say this about it:

The Potsdam Red Sandstone Co., Potsdam, N. Y.—'We consider the work a most admirable one."

H. A. Duffy, The Barre Granite Works, Barre, Vt.—'I have used your 'Expeditious Measurer' continually for thirty years, and found the same very valuable in ascertaining the cubic contents of granite, marble and other kinds of stone. I cheerfully recommend it to all dealers in stone. Time is money, and the use of this book saves time."

Columbian Marble Co., Rutland, Vt.—"We find your 'Expeditious Measurer' one of the most useful bookt in our office. It saves time enough to pay its coss every week in the year."

Sheldon Marble Works, New York.—"The 'Expeditious Measurer' is at hand, and its contents fully justifies its title. It should be in the hands of everyone who has any work in stone."

Until we find something better than this work, we shall cheerfully give it the first choice and recommendation

We sell it postpaid for.....$1.60. Two copies or more in one order..... $1.50 each.

Address **THE D. H. RANCK PUB. CO., 358 Dearborn St., Chicago.**

Peoria, Ill.—The organization of the Retail Granite and Marble Dealers' Association of Central Illinois is reported complete. Officers elected are: President, John Merkle, Peoria; secretary and treasurer, M. H. Meany, Jacksonville; first vice president, northern district, Louis Zinger, Pekin; second vice president, central district, W. H. Grindol, Decatur; third vice president, southern district, W. H. Lathrop, Newton; executive committee—M. H. Meany, Jacksonville; Henry Triebel, Peoria; Charles Richter, Springfield. The next meeting will be held the third Wednesday in June at Springfield.

Ft. Plain, N. Y.—Quarrymen at Ft. Plain struck for $1.50 a day.

Nelson, Ga.—Early in the morning of March 14 the "rain descended and the floods came," and the two dams here belonging to the Blue Ridge Marble Company broke. Fortunately the water escaped gradually, but as it was the mill was flooded and left with a coating of about a foot of mud. Some other slight damage was done to barns and fences in the path of the water. No one was injured, as the night watchman gave warning in time for all to get out of the way. The damage done is estimated at about $500.

Perryville, Tenn.—J. W. Alley, of Memphis, will open a rock quarry at Perryville.

Essex, Conn.—The Washington quarry located in the north part of town, is soon to resume business.

Youngstown, O.—Stone-cutters on the new government building struck for an advance from 40 to 45 cents per hour.

Bedford, Ind.—The Bedford, Indiana, Stone Company resumed operations at its quarry after being shut down since last fall.

Fredonia, Kan.—Silas Prange, marble, reported to have released chattel mortgage for 49.

Quincy, Mass.—Martin & Collins, granite tools, reported to have recorded chattel mortgage for $150.

Salisbury, Mo.—M. L. Ewald, marble, reported to have recorded chattel mortgage for $304.

Troy, O.—Ritter & Prince, marble. Chas. Ritter reported to have given real estate mortgage for $450.

The Joyce-Cridland Co.

Dayton, O.

Manufacturers of

Patent Lever, Compound Lever, Screw and Hydraulic

JACKS

for Stone-Yard Use.

Illustrated catalogue free.

We Need The Following

Issues of STONE to complete our files:

DECEMBER	1892
FEBRUARY	1893
MARCH	1893
APRIL	1893
MAY	1893
AUGUST	1893
SEPTEMBER	1893
OCTOBER	1893
NOVEMBER	1893
JANUARY	1894
MAY	1894
JULY	1894
JANUARY	1895
MAY	1895

We will extend the subscription term of any of our subscribers copy for copy. That is, for each one of these issues we will tack on one issue to the subscriber's term. If you don't bind the magazine, look over your numbers on hand and send to us any of them here listed, and we will be greatly obliged to you.

BOOKS

FOR QUARRYMEN, STONE-WORKERS, CONTRACTORS, ARCHITECTS:

Redfern	**Ancient Sculpture**	$2.00
Ames	**Alphabets**	1.50
Richardson	**Architectural Modeling**	60
Hendricks	**Architects' and Builders' Guide**	5.00
Kidder	**Architects' and Builders' Pocketbook**	4.00
Cain	**A Theory of Voussoir Arches**	50
Allen	**A Theory of Arches**	50
Baker	**A Treatise on Masonry Construction**	5.00
Guttman	**Blasting**	3.50
Andre	**Blasting Rock**	3.00
Burgoyne	**Blasting and Quarrying**	60
Van Nostrand	**Builders' and Contractors' Price Book**	1.40
Trautwine	**Civil Engineer's Pocketbook**	5.00
Richards	**Compressed Air**	1.50
Glynn	**Cranes and Machinery**	60
Wegmann	**Design and Construction of Masonry Dams**	5.00
Le Conte	**Elements of Geology**	4.00
Haswell	**Engineers' and Mechanics' Pocketbook**	4.00
Johnson	**Engineering Contracts and Specifications**	4.00
Nash	**Expeditious Measurer**	1.50
Bertholet	**Explosives and Explosive Compounds**	50
Sturges	**European Architecture**	4.00
Grimshaw	**Engine Runner's Catechism**	2.00
Davidson	**Gothic Stonework**	1.50
Jannettaz	**Guide to the Determination of Rocks**	1.50
Burnham	**History of Limestone and Marbles**	6.00
McMaster	**High Masonry Dams**	50
Blagrove	**Marble Decoration**	1 50
Lee	**Marble and Marble Workers**	80
Dobson	**Masonry and Stone Cutting**	1.00
Booth	**Marble Worker's Manual**	1.50
Vago	**Modeling in Clay**	1.00
Biggin & Siebert	**Modern Stone Cutting and Masonry**	1.50
Collins	**Mining and Quarrying**	60
Gall	**Monumental Designs** per set	5.00
Spon & Chamberlain's	**Pocketbook of Alphabets**	25
Edwards	**Practical Steam Engineers Guide**	2.50
Beaton	**Quantities and Measurements**	60
Kirk	**Quarrymen and Contractors' Guide**	2.50
Gillmore	**Report on Strength of Building Stones in the U. S.**	1.00
Blagrove	**Shoring**	60
Hyde	**Skew Arches**	50
Davies	**Slate and Slate Quarrying**	1.20
Burn	**Stonemason and Bricklayer**	2.00
Monckton	**Stair Building**	4.00
Merrill	**Stones for Building and Decoration**	5.00
Luard	**Stone, How to Get it and How to Use it**	80
Bale	**Stone-Working Machinery**	3.60
Warren	**Stereotomy: Problems in Stone-Cutting**	2.50
Geikie	**Text Book of Geology**	7.50
Rothwell	**The Mineral Industry, Vol. IV., 1895**	5.00
Cain	**Theory of Solid and Braced Arches**	50
Hodgson	**The Steel Square and Its Use**	1.00
Stahl	**Transmission of Power by Wire Rope**	50
Caseley	**Treatise on the Theory of the Construction of Helicoidal and Oblique Arches**	50
Drinker	**Tunnelling**	25.00
Nichols	**Tables of Cubic Measure**	50
Nichols	**Tables of Superficial Measure**	50
Cain	**Voussoir Arches Applied to Stone Bridges, etc**	50

Remittances must accompany all orders. Prices quoted include cost of mailing. Order by title and author Write your name plainly. Remit by postoffice or express money-order, draft or check, to the order of

D. H. RANCK PUB. CO , 358 Dearborn St., Chicag Ill

Huntington, W. Va.—M. N. Hambleton, monuments, etc., reported to have given deed of trust for $1,620.

Denver, Col.—Geddis & Seerie, stone contractors, reported to have given warranty deed for $101,400.

Baltimore, Md.—Charles A. Heagy, proprietor of the Middletown Marble Yards, and one of the most prominent and well-to-do citizens of this place, died at noon March 1, from consumption, aged fifty-four years. He had been a director of the Valley Savings Bank ever since its establishment here, about twelve years ago. He leaves a widow, but no children.

Washington, D. C.—Plans were prepared by Architect William J. Palmer for the erection of the new Ebenezer M. E. Church at Washington. The contract for the erection of same has been awarded to Mason & Harper, of Anacostia, D. C. To cost about $30,000. Rev. M. W. Clair, pastor.

Lee, Mass.—W. H. Gross has secured the contract to furnish about 30,000 feet of marble for the large Foster summer residence which is to be built on the main road to Lenox. In both quarrying and teaming this will give employment to a large number.

Chester, Vt.—The Union Soapstone Company have leased the Staples quarry and have engine ready to commence work with a full force of workmen.

Wheeling, W. Va.—R. H. D. Willis announces that he is about to add an extension to his present business (coal) by handling builders' supplies of all kinds—stone, brick, lime, plaster, etc. He is now corresponding with producers to complete arragemnents toward that end. His yard is located on the B. & O. tracks and has a siding capacity of twenty cars, as well as ample storage room.

Lanark, Ill.—Mr. Thomas, of Mt. Carroll, has gone into partnership with F. A. Ehmer, of Lanark, in the tombstone business and is the traveling salesman for the firm.

Santa Anna, Tex.—David Hughes, a contractor from Fort Worth, Tex., who has the contract to furnish stone for the new Santa Fe depot at Galveston, has opened up a fine rock quarry at Santa Anna. The stone he is uslng is a light blue sandstone and is said to be as fine rock as is to be found in the state for ornamental and durable work. The supply of sandstone and limestone is inexhaustible.

Increase your Sawing and Reduce the Cost by Using

"KRUSHITE."

Cuts Faster, Lasts Longer, Gives Better Results than Any Other Material. (See Prices Current.)

A Trial will Demonstrate its Qualities.

FRENIER & LeBLANC, RUTLAND, Vermont.

Locations for Industries.

The name of the Chicago, Milwaukee & St. Paul Railway has long been identified with practical measures for the general upbuilding of its territory and the promotion of its commerce, hence manufacturers have an assurance that they will find themselves at home on the Company's lines.

The Company has all its territory districted in relation to resources, adaptability and advantages for manufacturing, and seeks to secure manufacturing plants and industries where the command of raw material markets and surroundings will insure their permanent success

Mines of coal, iron, copper, lead and zinc, forests of soft and hard wood, quarries, clays of all kinds, tanbark, flax and other raw materials exist in its territory in addition to the vast agricultural resources.

The Chicago, Milwaukee & St. Paul Railway Company owns 6,168 miles of railway, exclusive of second track connecting track or sidings. The eight states traversed by the Company, Illinois, Wisconsin, Northern Michigan, Iowa, Missouri, Minnesota, South Dakota and North Dakota, possess, in addition to the advantages of raw material and proximity to markets, that which is the prime factor in the industrial success of a territory—a people who form one live and thriving community of business men, in whose midst it is safe and profitable to settle.

A number of new factories and industries have been induced to locate—largely through the instrumentality of this Company—at points along its lines. The central position of the States traversed by the Chicago, Milwaukee & St. Paul Railway, makes it possible to command all the markets of the United States. The trend of manufacturing is westward. Confidential inquiries are treated as such. The information furnished a particular industry is reliable.

Address,

LUIS JACKSON,
Industrial Commissioner, C. M. & St. P. R'y,
435 Old Colony Building, CHICAGO, ILL.

Subscribers

Will do us a favor by sending postal card notice when the magazine fails to reach them. The newspaper mails are heavily burdened and consequently slighted by over-worked post-office clerks, and often go astray. We will always send duplicate copies.

CLUB LIST.

MAGAZINES.

	Publisher's Price.	Our Price with STONE.
Arena	$3.00	$4.25
Argosy	1.00	2.60
Atlantic	4.00	5.20
Century	4.00	5.50
Chautauquan	2.00	3.60
Cosmopolitan	1.00	2.60
Forum	3.00	4.50
Godey's Magazine	1.00	2.60
Harper's Magazine	4.00	5.20
Harper's Round Table	2.00	3.50
Harper's Weekly	4.00	5.20
Harper's Bazar	4.00	5.20
Judge	5.00	6.00
Lippincott's	3.00	4.00
McClure's	1.00	2.60
Munsey's	1.00	2.60
North American Review	5.00	6.00
Public Opinion	2.50	4.00
Popular Science Monthly	5.00	6.50
Puck	5.00	6.00
Peterson's	1.00	2.60
Review of Reviews	2.50	4.00
St. Nicholas	3.00	4.50
Scribner's	3.00	4.50
Scientific American	3.20	4.60
Youth's Companion	1.75	3.25
Pall Mall Magazine	3.00	4.70

PERIODICALS.

The Inland Architect	$5.00	$6.00
American Architect	6.00	7.50
Engineering News	5.00	6.00
Engineering and Mining Journal	5.00	5.75
Reporter	2.00	3.00
Monumental News	1.00	2.00
American Contractor	5.00	5.75
Engineering Record	5.00	6.50
Granite	1.00	2.75

NEW SUBSCRIBERS ONLY.

Remittance must accompany all orders. Prices quoted include cost of mailing. Write your name plainly. Remit by postoffice or express money-order, draft or check, to the order of

D. H. RANCK PUB. CO., 358 Dearborn St., Chicago, Ill.

Hartford, Conn.—The Committee of the Superior Court, to whom was referred the suit of the National Granite Company against August Langefeld, has made report that the plaintiff is entitled to recover $997.22.

Bellefontaine, O.—The Bellefontaine Stone and Lime Company have sold their plant to Hamilton Bros., who have taken possession and will continue the business at the quarries west of town.

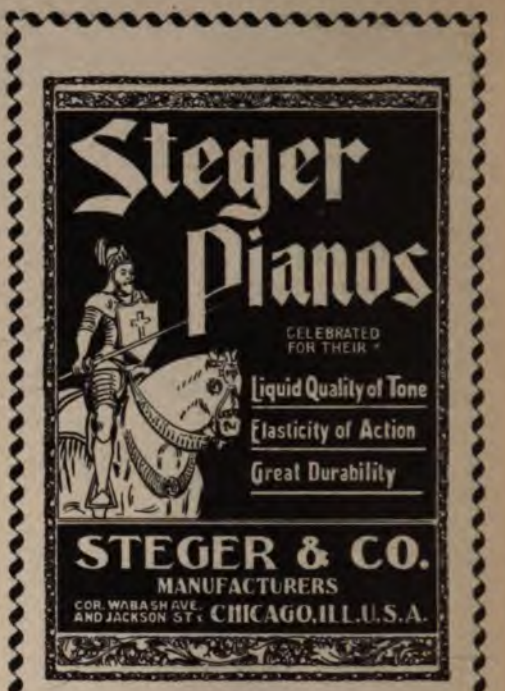
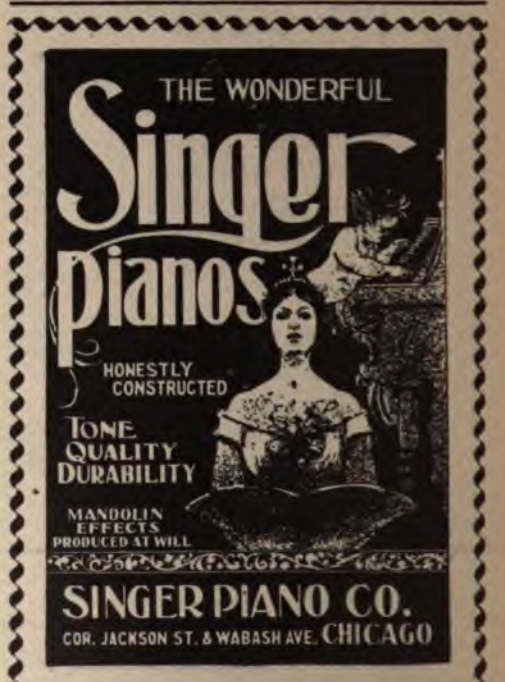
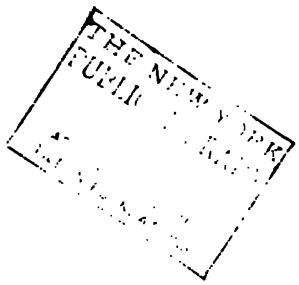
Fort Collins, Col.—The stone industry of Larimer county has recently received a remarkable impetus. Joe Gray, lessee of the Stout and Arkins quarries, has orders for 650 carloads of stone and will put on a force of from fifty to seventy-five men at work immediately, while the other quarrymen all along the glade will open up their quarries with increased forces of laborers. The greater part of the stone thus far contracted for will go to Denver.

Long Island City (Ravenswood), N. Y.—Gould & Morris, freestone, reported to have given judgment for $286.

Independence, Kan.—F. W. Garlinghouse, marble, reported to have recorded chattel mortgage for $1,057.

Mr. Osborne, of Websterville, has purchased a lot of quarry land at Washington, Vt., for $500, and has uncovered a large sheet of marble.

An adjourned meeting of the Virginia State Granite Company, Richmond, Va., was held March 1 and it was decided to again begin work at a very early date in the company's quarries, located in Chesterfield county. The controlling interest in the stock of the company is owned by Mrs. Kate A. Donohoe, of Long Island, who was represented at the meeting by E. W. Wilkinson, of West Point. All the old officers of the company were re-elected. The quarries will give employment to a number of workmen.

A meeting of the quarrymen of Minneapolis was held March 3, and the enthusiasm shown promises that the purpose of their meeting will meet with success. They adopted a schedule of prices on stone for different districts of the city, these prices to take effect March 20. They have also made an agreement with the Stonemason's Union, of Minneapolis, by which the two organizations will work together to maintain a living price for material, and for stonemason work.


THE NEW YORK
PUBLIC

From the wall painting in the Hotel De Ville, Paris.

ARBORICULTURE.

By P. C. Galland.

Reprint from *The Architect*, London.

STONE

VOLUME XIV. MAY, [illegible]

THE BUILDING STONES OF NEW ENGLAND

THE use of any kind of building stone in the United States dates from a comparatively recent period. Until the country became well settled and developed its resources quarrying received little attention. Wood was the material for considering the question of building materials. After there was wood which the surrounding forest afforded; but as the country prospered and settlements became permanent, there arose a demand for some material which would be more durable and ornamental than the then existing wooden structures. The first stones quarried in the early settlements were clay slates, but these were worked in only a small way and were used principally for gravestones and for lintels and door sills. The early use of granite in New England was probably due more to its accessibility than from a desire to use such refractory material, but it is known that the numerous granite boulders which were strewn over the country afforded the material for the first stone structures in New England. The matter of transportation was probably an important item in determining the use of these. The first quarries for building stone were opened at Chelmsford, Mass. Granite was procured there for the old Boston court house in 1810. In 1812 granite was quarried at Concord, N. H., and used in constructing the old state prison, and in 1816 more was extracted to build the state house in that city. It was not, however, until several years later that granite began to be used extensively in and about Boston, and the demand for stone led to the opening of the famous Quincy quarries. The success attending this venture attracted the attention of people to other localities, with the result that the granite industry has increased by successive stages until now it ranks among the great industries of the state, the quar-

THE NEW YORK PUBLIC LIBRARY
ASTOR, LENOX AND TILDEN FOUNDATIONS

STONE

VOLUME XIV. MAY, 1897. NUMBER 6.

THE BUILDING STONES OF NEW ENGLAND.

THE use of any kind of building stone in the United States dates from a comparatively recent period. Until the country became well settled and developed no leisure opportunity occurred for considering the question of building materials other than wood which the surrounding forest afforded, but as the country prospered and settlements became permanent, there arose a demand for some material which would be more durable and ornamental than the then existing wooden structures. The first stones quarried in the early settlements were clay slates, but these were worked in only a small way, and were used principally for gravestones and for lintels and door-sills. The early use of granite in New England was probably due more to its accessibility than from a desire to use such refractory material, but it is known that the numerous granite boulders which were strewn over the country afforded the material for the first stone structures in New England. The matter of transportation was probably an important item in determining the use of these. The first quarries for building stone were opened at Chelmsford, Mass. Granite was procured here for the old Boston court house in 1810. In 1812 granite was quarried at Concord, N. H., and used in constructing the old state prison, and in 1816 more was extracted to build the state house in that city. It was not, however, until several years later that granite began to be used extensively in and about Boston, and the demand for stone led to the opening of the famous Quincy quarries. The success attending this venture attracted the attention of people to other localities, with the result that the granite industry has increased by successive stages until now it ranks among the great industries of the state, the quar-

ries of Massachusetts furnishing in 1894 stone of the value of nearly two million dollars.

Rocks are mineral aggregates. Usually the number of minerals essential to the composition of any rock is few, but upon their character, their structure, and the cohesion existing between them, as well as the presence of accessory minerals, depend to a large extent their suitability for building purposes and their artistic appearance for ornamental work. As an example of this, quartz and feldspar are the essential minerals of granite; mainly upon the characteristics, however, of feldspar, and the presence or absence of accessory minerals, like mica or hornblende, depend the qualities of the various granites. And in considering the qualities of rocks, we should notice both their physical as well as their chemical properties.

Under the head of physical properties we must primarily consider the question of density; this is an important quality, as upon this depends in a great measure the relative strength of the stone, the weight, and the power of absorbing liquids or gases. We may say in general that any stone which has a specific gravity of less than two, with a corresponding rate of absorption greater than one in twenty-four, is unfit for general building and will be unsuitable for an ornamental stone.

Toughness.—This character depends first, not only on the constituent minerals, but secondly, upon the manner in which they are associated. Many rocks whose component parts are relatively high in the scale of hardness, are so incoherently associated that upon exposure to climatic changes, they soon crumble to pieces. An example of this is seen in the loose, friable sandstones, which are almost wholly composed of quartz, and in which the cementing material is so weak that under exposure to the weather the cement soon loses its power and the rock crumbles away. This is true only of the more inferior qualities of sandstone.

State of Aggregation.—This is one of the most important properties of stone, since on this depends in a great measure the hardness of a rock, its working qualities and its degree of resistance to weather. Many rocks composed of hard materials work easily because the grains are loosely coherent, while rocks composed of softer materials may be very tough, owing to the strong cohesion of the different particles. Also upon the state of aggregation and the fineness of grain depend very largely the condition of fracture; this is very important to the stone-worker, as a stone which possesses a straight fracture, other things being equal, commands a higher price than one which cannot be depended upon to break evenly. This, of course, means a great deal to the quarryman, not only in the saving of material, but also in the relative amount of time and labor spent in shaping a block after its removal from the quarry.

Structure.—Structure is another important physical property of a rock.

PLATE I.

Thin section, showing granular structure of granite. (From a microphotograph, enlarged 25 diameters.)

It may be classified under three heads: Crystalline, as seen in granites; vitreous or glassy, not commonly found in building stones, but occurring in pitch stones; and, third, fragmental, typical among the various sandstones. We are generally able to distinguish the structure by the unaided eye, but oftentimes we must have recourse to a microscopic study of thin sections, when the structure is thus prominently brought out. By this latter method many points are discovered which could not be ascertained in the usual way, such as methods of arrangement, freedom from decomposition and physical condition of the component minerals; also the presence of many minute, but to the architect very important minerals, which would otherwise remain undiscovered.

Chemical Properties.—The lasting qualities of a stone are dependent to a large extent upon its chemical properties. The architect must always bear in mind the conditions to which the stone is to be put. A limestone which would prove sufficiently durable for structures in the country, when exposed to the acid gases which are always present in a city atmosphere, may be rapidly disintegrated and weakened. The same is true of different forms of iron in the stone. This has an important bearing on the changes of color in the rock. (Special cases will be noted later.)

The weathering of building stones is caused by the physical alternations of heat and cold, associated with the rather complex chemical action resulting principally through the agencies of oxidation or solution. It is fair to assume that nowhere is a stone subjected to conditions which test its enduring qualities more than the climate of New England where the seasonal and diurnal temperature range is often very great. Stones are, as a rule, poor conductors of heat, and are not very elastic. As we have seen, they are mineral aggregations which are more or less coherent, each constituent of which possesses separate degrees of expansion and contraction of its own. In crystalline rocks these different elements are practically in contact, while in sandstones they are removed from one another by a filling of various degrees of porosity and elasticity; as temperatures rise, each and every particle expands with an appreciable force which in the aggregate becomes enormous; as the temperatures fall there is a corresponding amount of contraction. Thus in a climate like ours there is ever a constant movement of the individual grains, which can only result in a gradual weakening and dissolution of the rock. This movement is so appreciable that at times it can be measured. Thus it has been shown in the case of Bunker Hill monument, that a hollow structure 221 feet high and 30 feet square at the base, there is a lateral movement toward the sun; and a pendulum suspended from the top will describe an irregular ellipse during a sunny day of nearly half an inch in its greatest diameter. This expansion and corresponding shrinkage gives rise to cracks and joints, which, after a time, remain permanently open and allow ready

access of water. If this is the case with stones of ordinary dryness, the results are even more disastrous with those which become easily saturated with moisture and are afterwards exposed to alternating thawing and freezing. By careful experiments it has been shown that water passing into a solid from a liquid state exerts a pressure of 138 tons to a square foot, or, as Prof. Geikie strikingly illustrates it, equal to the weight of a column of ice a mile high. Therefore, as it is well known that no stone, however strong, can resist such enormous forces, it follows that, other things being equal, those stones which absorb the least water will be the most durable.

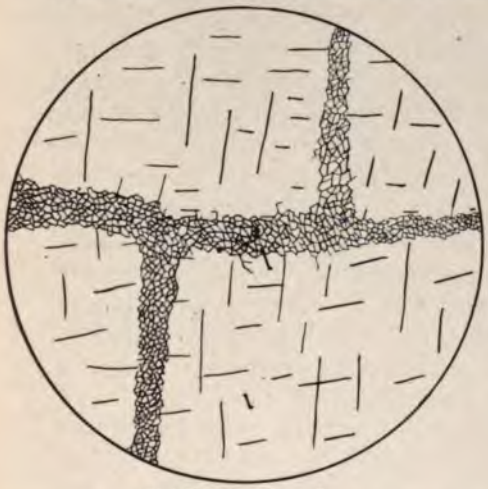


PLATE II. FIG. 1.
Diagram showing microscopic appearance of rift and cut-off in feldspar grain. Magnified 25 diameters.

PLATE II. FIG. 2.
Diagram showing microscopic appearance of rifting plane in granite. The rift is seen traversing the feldspar and passing around quartz grains. Magnified 25 diameters.

It is thus seen that the test of the rate of absorption is a very necessary one. The porosity of a stone is usually shown by its manner of drying after a rain. Some will dry quickly, while others will remain damp for a long time, showing the large amount of moisture absorbed.

Chemical Agencies.—The agencies which produce chemical changes in the rock are especially injurious in a city atmosphere. The normal atmosphere consists of oxygen and nitrogen in the proportion of four of the former to one of the latter. The oxygen actively attacks substances, or, as it is termed, rusts them. Iron, when in the form of pyrite, is easily affected. When this mineral occurs in aggregations or bunches, an unsightly mass of blotches or discolorations is produced, which can only be regarded in the light of a blemish. When, however, the pyrite is disseminated in small particles evenly through the rock, the oxidation is neither so

harmful nor discernible, resulting only in a gradual mellowing of color through the whole rock. This is well shown in some of the Ohio sandstones; indeed, in many cases this is of practical benefit, as the additional cement (oxide of iron) thus formed knits together the particles of rocks more firmly than ever before, and often improves their appearance.

The problem resulting from the solvent agencies is a graver one. Pure water alone has an indistinguishable effect on rock. Rainwater, however, charged with the numerous acids acquired in its passage through a city atmosphere, or even normal rainwater, has considerable solvent power, as is seen only too well in the rapid destruction of certain stones in our city structures. Marbles and limestones are especially attacked by this agent, and the lime carbonate is easily dissolved out, thus weakening their coherency and furnishing cracks and fissures for the entrance of water, to weaken further and destroy the rock, as we have seen, by alternate freezing and thawing.

General Considerations on the Selection of a Building Stone.—From a perusal of the foregoing it must be evident to any one that many more factors enter into the determination of the value of a stone than are usually taken into consideration. It may then be well to suggest a few general principles to serve as an aid in selecting building stones, where durability or permanence of color are desired. To sum up, the main points to be considered, in their order of importance, are as follows:

1—Resistance to temperature changes.

2—Crushing strength and elasticity.

3—Resistance to chemical action of the atmosphere.

4—Resistance to abrasive action of feet, or wind-blown sands.

This order may be changed to suit individual cases, but in general the arrangement given above applies to stone suitable for walls of buildings to be exposed to the variable climate of the Eastern and Northern States. In these states, with an annual rainfall of forty inches or more, and a variation of temperature in some sections reaching as high as 120 degrees, the conditions are evidently more trying than would be met with in a more uniform and a drier climate. A porous sandstone which would be thoroughly disintegrated by a year's exposure in New England might last for hundreds of years in a climate like that of New Mexico.

In the glaciated regions of the United States, roughly speaking, a territory lying to the north of a line drawn from New York City westward to the Mississippi River and thence north-west to Montana, (where the accumulated rotten rock of past geological ages has been worn away) if the surface of the rock in the quarry or natural outcrops is not decomposed, it may be consided a good stone as far as weathering qualities are concerned.

By the term granite we mean a crystalline rock composed essentially of

PLATE III.

Section of granite quarry showing absence of vertical joint planes and the presence of horizontal joints. Largest vertical surface 25 feet long. Quarry face produced by breaking along rift and cut-off.

the minerals quartz, potash feldspar (orthoclase) and both the light and dark micas, called respectfully muscovite and biotite; in most cases other minerals occur as accessories and have great value in determining the appearance and character of the different varieties of granites, the most common being hornblende and pyroxene. (Plate I.) Quartz is seen in clear irregular and usually colorless grains. Feldspar occurs in dull granular particles generally opaque, though sometimes transparent, generally white but often colored and rarely ever colorless. Micas can be distinguished in bright glittering scales either white or black according to the variety. Hornblende occurs in building stones generally in dark or almost black areas, which are very tough and not readily separated into scales as is the case with mica; it takes a good and lasting polish. Pyroxene resembles hornblende in the hand specimen, but is more brittle, and owing to this character does not polish so well. (Plate VIII).

Iron pyrite is found in varying amounts in all granites. It is of a brassy yellow color and occurs in small cubes or patches; and its presence in the rock in any considerable quantity is highly detrimental, as exposure to the weather soon produces a discoloring stain. In most granites, small shining specks with angular outlines and of a bluish-black color can be distinguished. This is magnetite and is not generally harmful as it is not easily decomposed on exposure to the weather.

ORIGIN OF GRANITES.

The views held in regard to the origin of our granites have been at variance with one another, and have undergone radical changes since the scientist first began to study these rocks. The two principal theories advanced to account for their formation have been directly opposed to each other: one class of geologists believed they were derived from other rocks such as slates and sandstones, by becoming melted and then cooled; the other class believed that they were originally in a fluid condition and were forced into the earth's crust in this state from great depths below the earth's surface. This theory is now antagonized by only a few geologists and has come to be accepted as the true one, the evidence pointing to this conclusion being overwhelming. An example of the kind of evidence which supports this view may be observed in Quincy, Mass., where the granite comes in contact with slate; here the slate appears sharply separated from the granite, is locally baked and hardened by its action, and some fragments occur included in the granite which were broken off by the force of the intruding rock. The granite was of course surrounded by masses of much cooler rock, and during the processes of cooling and consequent contraction, (and the process was a slow one, as is proved by crystallization having taken place in all cases) joints or fracture planes were formed parallel to

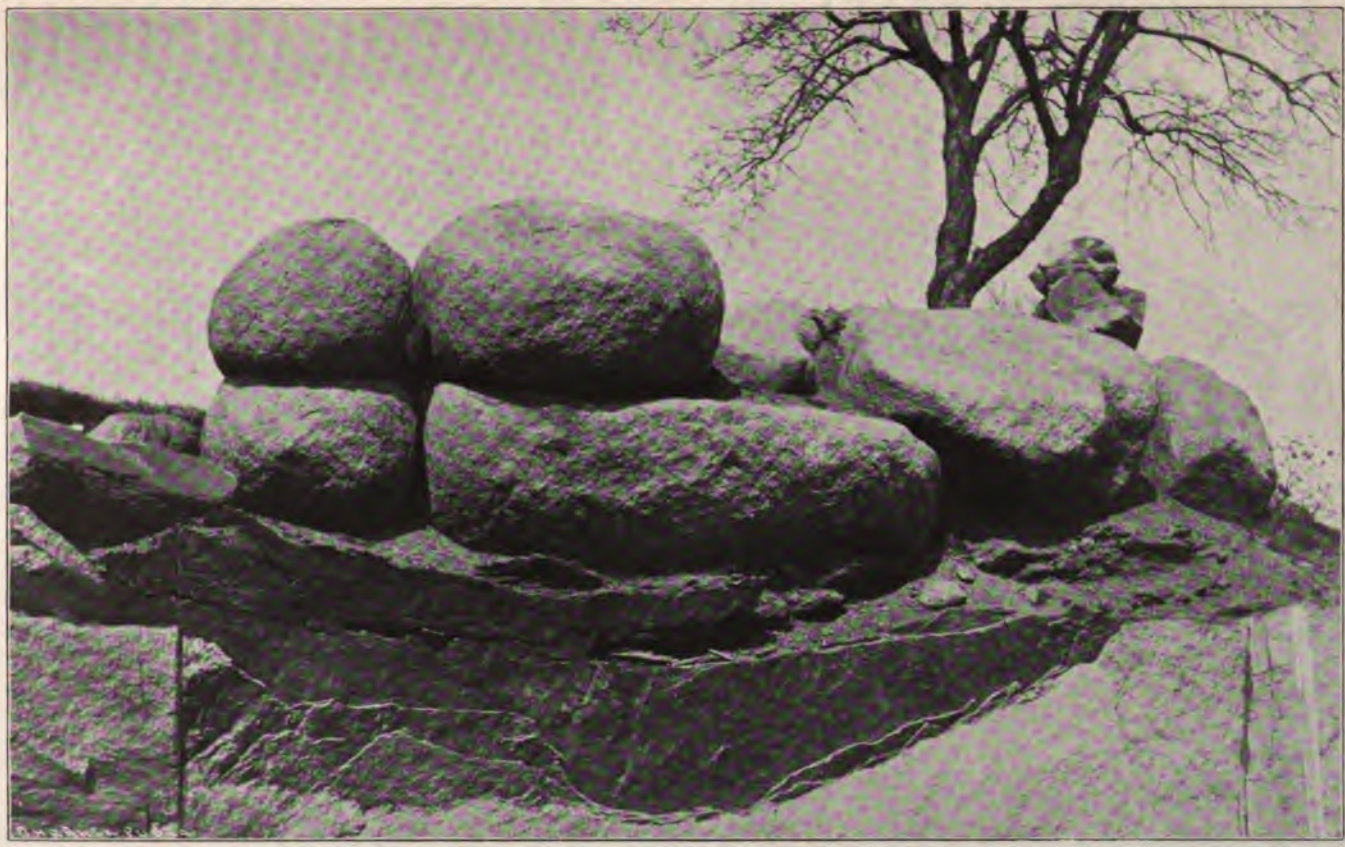


PLATE IV.
Boulders of disintegration (in place) showing sperical weathering of granite.

the bounding walls of the surrounding rocks. Thus were formed the nearly horizontal beds, or sheets as they are technically called, which are such a valuable aid to the quarryman. These joint planes are generally irregular in position and are more or less dome-shaped. (See Plate III.)

Before the granites were exposed to our view by the wearing away of the overlying rocks, various other forces had been at work, and although their action has not in all cases become evident at first glance, yet with the microscope we find that in some granites two other sets of fracture plans have been developed, depended upon minute dislocations of the different particles, which have occurred in every cubic inch of rock; these are generally vertical to the other set and are more regular; and are frequently at right angles to each other. This is the explanation of the "rift" and "grain" "cut-off" of granites, the term "rift" being applied to that plane along which the granite breaks the easiest. The microscope shows all stages between the most incipient breaks and complete joints. These planes of weakness have been caused by the forces which have produced our mountain ranges, and they coincide in direction with the two most pronounced rectangular sets of joint planes occurring in the quarry, the "rift" being parallel to the most numerous and best developed set of joints, the "grain" or "cut-off" being parallel to the set of joints at right angles to this. (Plate II. Figs 1 and 2.)

Aside from the benefit to the quarryman, a stone which has a very pronounced rift suggests important considerations in the matter of weathering. As we have seen the rift and cut-off are in reality lines of weakness which oftentimes appear as cracks; these will give a readier access to water and will thus aid the forces which tend to disintegrate the rock. Numerous cases are seen of freshly quarried rocks which after exposure to the weather for some years have been decomposed to boulders, and in at least one instance to the writer's knowledge, in the period of fifteen years exposure a stone has crumbled away to gravel along the rift planes. (See plate IV).

Consequently, a microscopic study is essential to a thorough examination of a stone as often the value of what would be otherwise a most excellent granite is utterly destroyed when rifting is developed to a great extent.

New England has been bountifully supplied with and has been greatly favored by a large variety of the most enduring and valuable stone occurrences. The varieties are innumerable, but in this article we shall take cognizance only of the types as seen in the most extensive and well-known quarries of this region.

MASSACHUSETTS.

Massachusetts stands at the head of the list as regards a producer of granite in this country. Foremost among the building stones of the United States is the Quincy granite. It is an even-grained rock of a dark gray

almost a blue color in the best variety, owing to the predominance of quartz which is seen in transparent crystals; the feldspar is noticed in opaque whitish bodies known by its reflection in side lights; hornblende in irregularly disposed black grains; biotite or black mica in glittering scales; pyrite is of rare occurrence, and magnetite is seen in small black specks. This forms a very hard and firm combination and resists the weathering effects of climate most admirably. Pillars which have been subjected to the harsh influences of the Boston climate as seen at the Custom House have shown no appreciable effects of weathering since their erection in 1838. The stone takes a high polish and dresses to a sharp edge; it is a very handsome stone rough dressed showing the natural fracture of the rock, or, a sit is termed-ashlar work. The quarries in Quincy are of large extent furnishing employment to many hundreds. They occupy the range of low-lying hills to the south-east of Boston, and are about six miles distant. Thirty or more quarries are in active operation, but the Railway quarry is the best adapted for furnishing the finest quality of dimension stone. This quarry was the first one established in this vicinity and was started to secure stone for Bunker Hill monument.

As an example of the durability of hornblende granites (of which the Quincy stone is one variety) we may cite the instance of the stone in King's Chapel, Boston. This building was erected in 1749 and is built of stone procured from the boulders which were found at that time in the neighborhood. As no appliances for stone cutting were then in use, the boulders were broken up and roughly trimmed in the following manner: Large fires were built about the boulder and when the stone became thoroughly heated, heavy iron weights were dropped upon it. With this treatment, and the fact that granite is considered a poor stone to withstand heat, we may well be surprised that after this considerable lapse of time the stone is as well preserved as we find it.

Hornblende granites are also found at Peabody and Lynnfield. These localities furnish very good building stone, but not up to the quality produced at Quincy.

Another locality in the state and one which supplies immense quantities of stone is situated on the peninsula of Cape Ann. The granite here resembles the Quincy but is a trifle coarser grained, is a little more gray, bordering on a greenish hue, and contains more pyrite; and as a rule it is better adapted for building work. The quarries are very extensive and readily yield stone of almost any dimension or quantity. Many of the public buildings in and around Boston have been built of this stone, notably the postoffice and the new court house. The Pigeon Hill, Rockport and Cape Ann granite quarries are a few of the principal plants in this section.

At Milford, situated a few miles from Worcester in the central part of

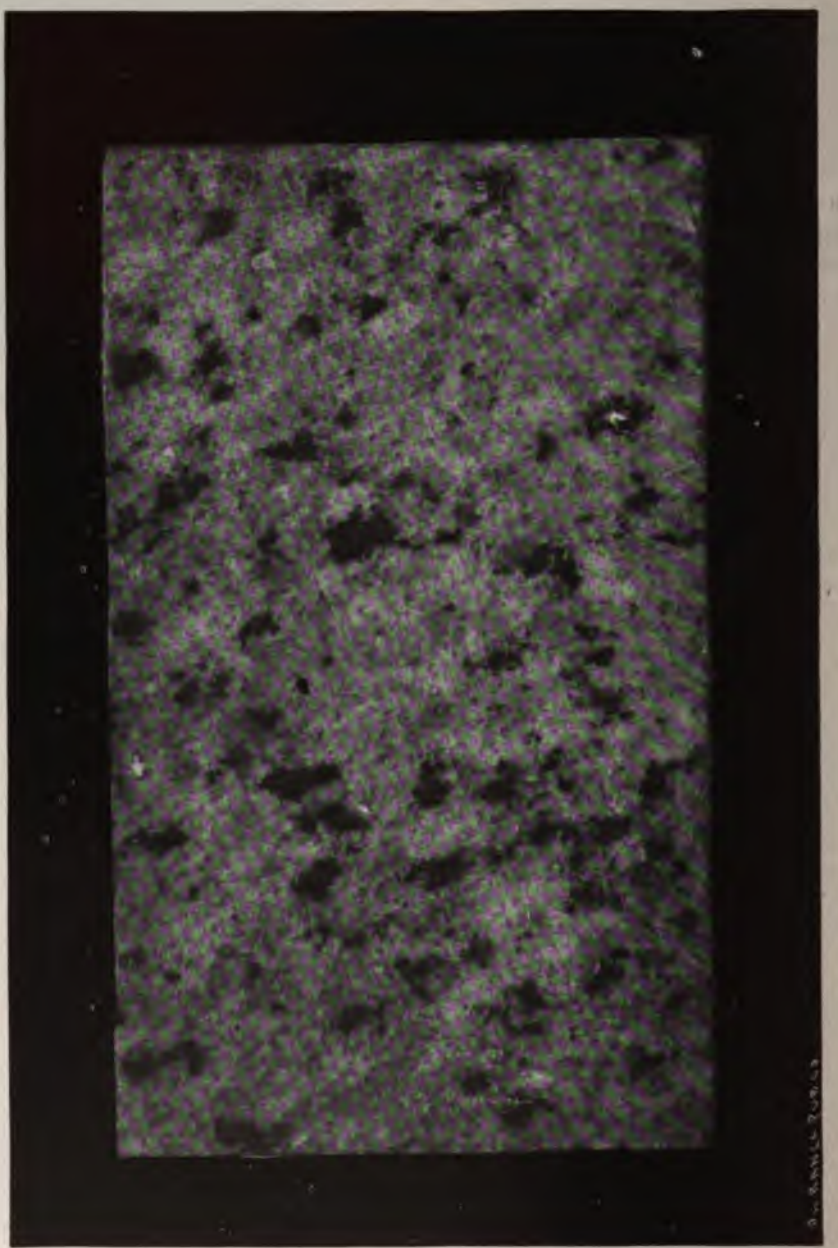


PLATE V.

Milford granite. Light portion of plate shows finely crushed quartz. From a photo graph of a polished surface. (Natural size.)

the state are the well-known quarries of Norcross Brothers; these are very extensively worked and furnish very large quantities of building stone. This is a coarse-grained rock and contains large amounts of biotite in irregular masses and faint bands; the quartz is snow-white and is finely granular in character, showing the results of strains to which it has been subjected; the feldspar crystals are of large size and are flesh-colored, and this combination produces a rock which is soft in tone and attractive to the eye. (Plate V.)

It makes an excellent building stone, especially for rock-faced, or ashlar work, and can be used with great artistic effect in contrast with other stones which have harsher outlines of structure, but the blotches of biotite are very plainly seen on dressed surfaces, and the stone is entirely unsuited for polished work on account of the large quantity of biotite present. Owing to its coarse and open texture; the stone is rapidly influenced by the weather, but as there is but a small quantity of pyrite present, it does not become greatly discolored. The beds will average two feet in thickness, and irregular joints occur in the quarry, but the workings are so extensive that any reasonably-sized stone may be procured. The depth of sap in the quarry would indicate it's not being a very durable stone.

Other occurrences of biotite granites are found in the vicinity of Fitchburg; these granites make very fair building stones, but are not good for high-grade work, nor for monumental or polished work.

At Monson, in the central part of the state, is quarried a light gray stone which is called a granite, but is in reality a gneiss, a term applied to rocks containing the essential minerals of granites but which have a banded structure. This stone differs from all other granites inasmuch as it was formerly a sedimentary rock, a pudding-stone, but through the operations of earth forces it has been transformed into a granitic rock. (Plate VI. Figs. 1 and 2.)

The stone is easily quarried and has extremely well pronounced rifting planes along which it breaks with the greatest ease. Also, as we may expect from the origin of the rock, it breaks readily in any direction at right angles to this. This admits of stone for bridge-work, curbing and flagging to be produced at minimum cost. The rock, of course, shows a banded structure on polished or hammered faces, and for this reason is best fitted for rough-dressed work. The quarries are of large extent and supply the demand for an inexpensive building stone in dimension stock which requires great length, and comparatively small width and thickness.

To Prof. B. K. Emerson, of Amherst, Mass., we owe our knowledge of this rock; he has discovered pebbles in the granite thus proving its sedimentary source.

MAINE.

According to latest returns, there are over 150 quarries now in active operation in the state of Maine. The great proportion of the workings are on biotite granites ranging in color from a light to a dark gray. Maine ranks second in the list of granite producing states with a valuation of product for 1894 of one and two-thirds million dollars. The largest quarry in the state and for that matter one of the most extensive stone-working plants in this country, is situated at Vinalhaven, Fox Island, Penobscot Bay. The annual output averages close to $100,000. These works furnish employment for 700 men. The rock is a coarse biotite granite of a grayish color; the

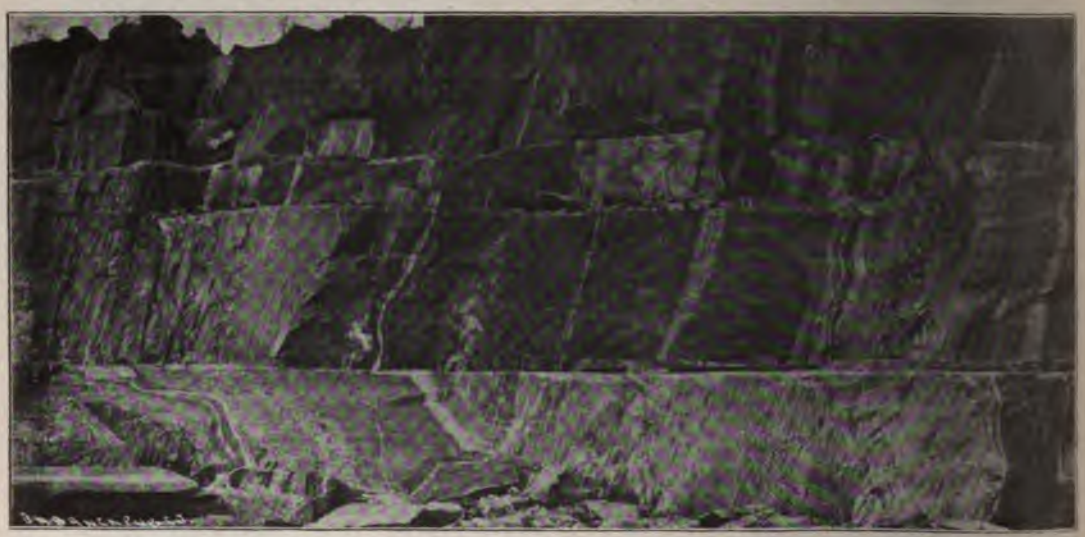


PLATE VI. FIG. 1.
A portion of the Monson quarry showing banded structure of the gneiss.

biotite occurs in small flakes and is very regularly distributed through the rock, as is hornblende which occurs in small quantites. The feldspars are usually gray although in some cases pink orthoclase is seen. The granite is easily quarried; the beds being thick and the jointing regular and open, admitting of large blocks being taken out. Several accessory minerals as zircon and apatite occur, but they are only seen in minute particles. The stone polishes well, and it is suited for both building and ornamental work. The product of these quarries has been extensively used all over the country. At Hurricane Island only three miles distant, a granite of the same type occurs. The jointing in this location is more frequent admitting of the quarrying of thin sheets as well as large blocks.

A rather rare occurrence of hornblende granite in Maine is seen at St.

George. (Plate VII). This is an even-grained rock containing hornblende in considerable quantities, shown in the plate, in angular black patches having a strained appearance. The feldspars are seen in white masses with cracks across them showing twinned structure. Quartz occurs in the rock in colorless, glassy grains, and biotite is present in large quantity evenly distributed in black flakes. Several other minerals like apatite and zircon are occasionally perceived.

The noted Hallowell stone is a true granite and contains mus-

PLATE VI. FIG. 2.
Banding of Monson gneiss shown in detail. (Natural size.)

covite as well as biotite in abundance, though evenly distributed in small flakes. This is a fine-grained rock of a generally even texture but sometimes showing a not unpleasing varied effect due to the inclusions of quartz areas in white feldspars.

Owing to its general evenness of structure it is much demanded for carved work or statuary, and has been used for this purpose to a much greater extent than any other Maine granite. An almost total absence of pyrite secures the rock from unsightly discolorations of rust. The stone does

not take a high polish owing to the large quantities of mica present. The quarries at Hallowell, and at Augusta a mile distant, are very extensive and have been worked for a number of years. Stone of almost any dimension may be secured.

The Maine and New Hampshire Granite Co., at North Jay, quarry a fine-grained, even-textured, light gray stone, consisting of colorless quartz in very fine grains, glassy potash feldspar, and both micas; these minerals are intimately bound together thus producing an admixture which gives a very soft effect to the eye. Biotite predominates largely over the muscovite, and both occur in small grains evenly distributed. The rock takes a very fair polish and is suitable for building work of a high order as it is a tough granite and withstands climatic conditions admirably. Another variety of granite, and a product of their quarries at Redstone, N. H. is a coarse-grained stone, consisting of large pink feldspars, locally tinged a faint green, probably through the decomposition to epidote, smoky granular quartz, and biotite in small patches. (Plate VIII). The stone takes a very fair polish, and shows a good contrast between rough and bush-hammered surfaces. It should prove a very handsome stone for ashlar work, having almost as soft an effect as the Milford granite, with the advantage that it is better adapted for exposure to the weather. This granite presents another phase, where the feldspars are completely stained a dull green color, to the entire obliteration of the pink; biotite is more abundant, the rock is finer grained and does not polish so well; also affords less contrast between rough and dressed surfaces. It resembles in a large measure the dark varieties of the Rockport stone.

Jonesborough and Red Beach are the localities which produce the bulk of the red granites; the colorless quartz grains, and both white and pink to blood-red feldspars are evenly distributed. Mica occurs only in small quantities and then in minute flakes. This composition and structure permits a very high polish to be secured and in this respect as well as in their more even texture, they excel the celebrated Scotch granites which command high prices in this country. They are in truth the superiors of any red or pink granites now quarried in this country, and are extensively used for monumental and interior, and also general building work.

At Somes Sound, is quarried a coarse textured pink granite; the colored feldspars are of large size, often two or three inches in diameter; it makes a good building stone, but its value for monument work is destroyed by its coarse texture.

Many of the biotite granites of the state are ruined by the presence of "knots" or masses of constituent dark minerals occurring locally concentrated.

Biotite largely predominates and affects the color. Such are found in

PLATE VII.

Hornblende-biotite granite. St. George, Maine. (From a microphotograph, enlarged 25 diameters.)

Biddeford and South Berwick. They are suitable for rough building work.

The so-called "black diamond" granites of Addison and other localities are not granites in the strict sense of the term, their proper name being diabase. (See plate IX.)

They furnish however an excellent monumental stone taking a fine and lasting polish; also suitable for interior work. They are fine grained, are of a dark gray color, some varieties being almost black. The rock consists principally of pyroxene and basic feldspars. Owing to the compact structure, and the interlocking together of the crystals of the different minerals, the rock is more difficult to work than the ordinary granite. The chief defect arises however from occasional irregular patches brought about by the uneven distribution of the component minerals. It is well fitted for interior decoration and is displacing the use of marbles for wainscoting and the like, on account of the improved machinery for working granites.

NEW HAMPSHIRE.

The granites occur in this state mainly in the central and eastern portions. They are generally similiar in character and composition, and belong in the class of muscovite-biotite granites.

They are fine grained and of a light gray, sometimes nearly white, color. The stone, which is typically found at Concord, consists of clear, glassy quartz, potash feldspar in pure white twinned crystals, and both white and black micas in fine grains regularly disposed through the mass. There are several accessory minerals, but as they only occur in very small amounts, do not affect the appearance of the rock to an appreciable extent. The almost total absence of pyrite preserves it from weather discolorations; in fact, the stone resists climatic conditions most admirably; buildings erected in the early part of the century show no depreciation of the stone. This can be learned by an inspection of the State House erected at Concord in 1816, and the old State prison at the same place in 1812. In these buildings it is seen that the feldspars have not lost their bright, glittering appearance, and the rock has preserved its integrity; and this is the more remarkable as the stone was procured at the time from practically surface outcrops. The new post-offices at Concord and Manchester, and the new congressional library at Washington, D. C., are a few of the many recent buildings composed of this stone. The rift and grain of the rock are especially well developed, thus enabling large blocks to be split to line with great ease. Notwithstanding this ease of working, no banded or any structure approaching that of a gneiss, is perceived. It makes an excellent building stone, both bush-hammered and rock-faced, but does not take a good or lasting polish, owing to the large amount of mica present, and it is a soft rock compared with many other granites. The principal quarries are located at West Concord. The Concord Granite company is one of the

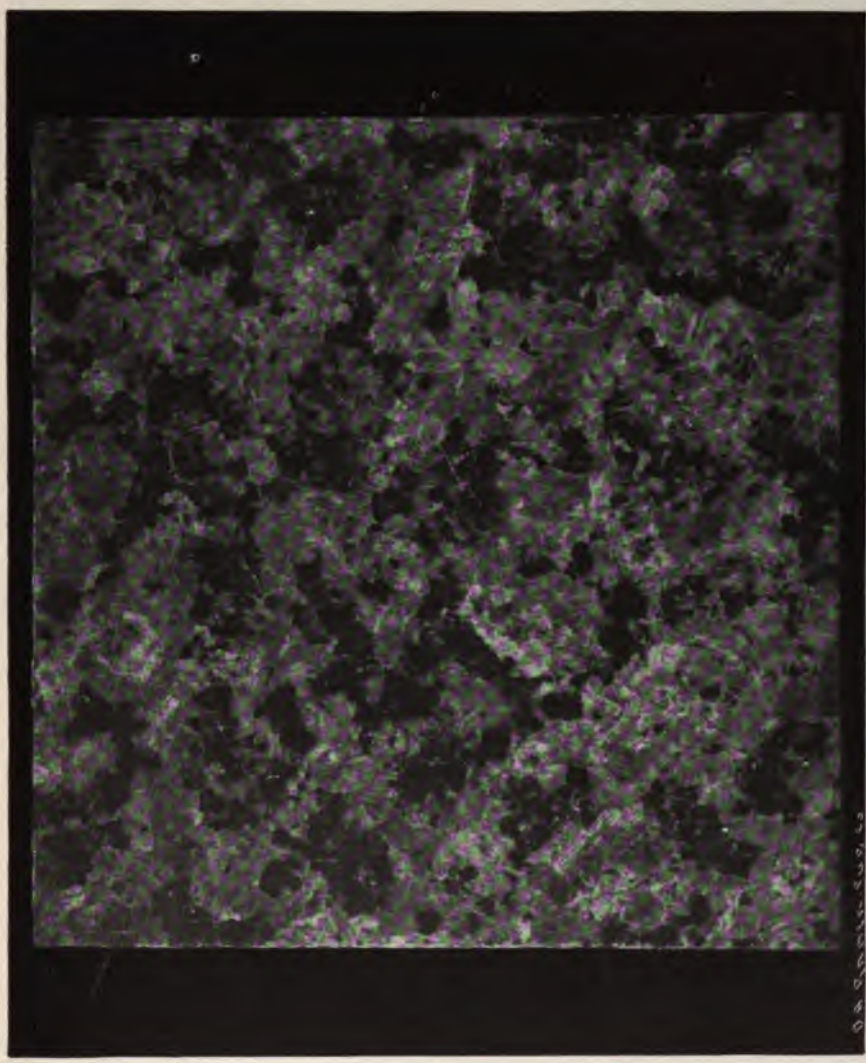


PLATE VIII.

Biotite granite from Redstone, N. H., showing texture of rock and contrast between feldspars and biotite. Photograph from polished surface. (Natural size.)

PLATE IX.

Diabase from Addison, Maine, showing white twinned crystals of plagioclase feldspar. Pyroxene is seen in angular black areas. (From a microphotograph, enlarged 25 diameters.)

largest concerns, and furnished the stone for the library building at Washington. The Railway Granite company is another large concern, and was one of the earliest quarries established. The stone for the state house, as mentioned above, and also for the city hall, Boston, was procured from this quarry.

Other quarries in this State are at Troy (operated by Norcross Brothers), Marlboro, Fitzwilliam, Milford, Sunapee and many other places.

VERMONT.

The granite quarries of this state, owing to the distance from the principal markets, furnish but small quantities of stone, except for local consumption. There is one exception in the case of Barre, situated in the northeastern portion of the state. The granite occurs in an isolated outcrop, and furnishes large quantities of stone, which find a market all over the United States. (Plate X.)

It is a fine-grained, light gray, biotite granite. The quartz is clear and glassy. The feldspars are small and snow white, and biotite occurs in considerable quantity. Its evenness of grain makes it highly desirable in monumental and carved work, but this is offset by the fact that the stone is relatively a soft one, and the feldspars early become deteriorated. Owing to the large amount of mica present, it is impossible to secure a good or enduring polish. There is but a slight contrast between the tool-dressed and rock-faced surfaces. This is objectionable for monumental work. Yet there is a great and constant demand for the stone. The quarries, of which there is a great number, are capable of furnishing dimension stock in large quantities. Other granite localities are Ryegate and Dummerston.

RHODE ISLAND.

The only locality which produces granite for more than local consumption is at Westerly, in the southwest corner of the state. The quarries here are very extensive and supply an excellent monumental and high grade building stone. The typical Westerly granite is very fine-grained and light gray in color, bordering at times on a bluish tint. Quartz in colorless grains and white feldspars are intimately associated. A considerable percentage of biotite is present in fine flakes; only a small amount of pyrite occurs. A variation in character in the same mass has produced the Westerly pink granite. Flesh colored feldspars, biotite in greater amount, brownish quartz, and a greater percentage of pyrite make up this phase of the rock. The stone is coarser-grained, and although susceptible of a good polish is not so suitable for carved or ornamental work as is the fine-grained type, it being used more for building work and columns.

The stone from this locality has been introduced in almost every city of any importance in the East and North, and is well known all over the

PLATE X.

Barre granite, showing decomposed state of feldspars. Pitted large dark area in centre, orthoclase partially altered to clay. Biotite is seen in lath-shaped individuals. (From a microphotograph, magnified 25 diameters.)

United States. The stone is especially fitted for carved and monumental work. Rhode Island stands first among the United States in the production of monumental and carved work.

CONNECTICUT.

Near the south end of Pond Mountain, in the town of Branford, six miles east of New Haven, are the quarries of the celebrated Stony Creek granite. This is rather coarse-grained and of a pink color. The quartz is colorless. Biotite is seen in considerable amounts, generally in fine particles, but often occurring in disfiguring blotches. Some of the feldspar crystals are flesh-colored and bright, others are stained a pale green due to their decomposition to epidote. The combination of colors thus produced gives a very softening and artistic effect to the rock, and the Stony Creek granite has become very popular among architects for this reason; but owing to the abundance and irregutar distribution of mica, as well as the decomposed condition of a part of the feldspars, it cannot be classed among those granites which are best adapted for withstanding the effects of weather. Judicious selection of stone in the quarry has resulted in the procuring of material which serves admirably for columns, and these are very beautitul when polished. The quarries are very extensive and are capable of furnishing large sized stock. Norcross Bros. have a large plant, and the Hallowell Granite Company also is well equipped for supplying this granite.

The granite that occurs at Millstone is probably a part of the same flow that is seen at Westerly, and resembles that granite in a great measure. It has not so compact a structure, however, and is a little coarser than the "blue" variety of that rock. There is also a larger percentage of biotite, and the stone does not take so high a polish. There is a greater contrast between the polished and tool-dressed surfaces which is a distinct advantage in its use as a building stone. The quartz is a greenish brown and the feldspars show few signs of weathering. It makes a very good building and ornamental stone for interior work, but is not so well adapted for monuments as is Westerly. Another variety of this kind of granite is found at Niantic. The occurrence of this granite is not favorable for securing dimension stock readily, owing to prevalence of "knots" and oftentimes a banded structure. The stone is better suited for rough building work, curbing and crosswalks.

Wm. Beals, Jr.

[TO BE CONTINUED.]

STONE IN ARCHITECTURE.

THE history of architecture is written in stone, although there are other channels needing the thorough investigation and study of the architect or designer, in the practice of the use of burnt clay and of concretes, and in wood and metal. In the decorative use of terra cotta in the Orient, in the middle periods, there is much to study and admire. It is, albeit, a pleasurable diversion, nevertheless but a diversion, and we turn with a feeling of trustful satisfaction to the true book, the story of the use of stone in architecture. I say that a *trustful* feeling comes to us in the study of the use of stone, and that is what I mean.

It may be from the inherent faith of man in the works of God, or of nature, or it may be from our own self-distrust that we take up and hew and place a block of stone, rather than resort to the use of any subterfuge of man. It may be the prompting of an æsthetic sense (I think this sense sometimes strongly enough developed to be the fifth sense), that turns one with a feeling of satiety from a work of great elaboration in a cheap and easily wrought material, to a restful wall and shaft of stone. I am not in the least worshipful but I could not bow down with quite an humble spirit before a terra cotta or a plaster altar!

I once saw a monument of concrete, a superior material, alas sure to be a thing of permanence, and truly in design of beauty its height and breadth were great, but I know I could not rest under or near something so lacking in the sense of right and wrong as a paste tombstone!

I wonder if this is not a good definition of the æsthetic sense—the faculty of discernment of harmony of material and design and purpose; or, plainly, in an æsthetic sense, to put the right thing in the right place. We can no more describe this sense than to describe the perfume of a rose, but we would not garnish a bunch of roses with onion stalks; and who has not seen an association of design fully as offensive as this suggestion.

And this is the moral: We may look into the earth, beneath the waters under the earth, or the heavens above, with no success for a material which is as unlikely to be used in the execution of a wrong as stone. There is not another of nature's materials which is used in the arts or crafts, but has been prostituted to that all-powerful monarch "machinery"; and I insist that to this influence may be traced with unfailing certainty the general "decay" of the artistic sentiment among craftsmen—the lack of individual responsibility.

I am a firm believer that the inherent truthfulness in the art of carving in stone will, with the shapening of the stone, shapen the character of the artist. I believe that with a nature at all sensitive not a line in the stone is cut upon which may rest a dash of sunlight to brighten, nor a shadow dug to deepen, but what will soften or strengthen this man's eye, hand and heart.

I may have had an unusually happy experience with the stone-cutters' craft, but I am bound to confess that I am fond of the stones themselves, of the art and of the craft. That the effect of their work is so surely discerned in the workmen is due to that evident and implacable bond between work and workingmen. He feels the individuality of his every stroke, and that the completed work will stand for all time as his, and though not signed like a painter's work the pride in it is no less strong.

It is quite easy to follow my deduction in the unhappy effect of reproductive work, and I have said that there is not a material used in the arts and crafts, except stone, which has not lent itself to reproductive methods, in which the sentiment and feeling are lost.

In the days of monumental construction when human labor had little intrinsic value and it needed only labor to open the bowels of the earth for stone to bury in ponderous walls, possibly it was not a wrong, possibly it was not a misconception of the destined purpose of stone in architectural work, but what greater vista of possibility is opened up to us by the light of John Ruskin's "Lamp of Truth." It would almost seem, however, as if the light shed by Mr. Ruskin's lamp has faded, flickered and its light been lost before reaching the continent of America. His encouragement to often practice, for instance, a more economical use of the more costly varieties of stone has surely been lost in the building work of this country, for we find among ordinary modern buildings but two forms of construction—brickwork and the old monumental construction, possibly somewhat modified but nevertheless representing the old form of bonding; just the same old thing that Mr. Rameses used in his practice in Egypt a thousand years before Christ.

It does seem odd that building construction should not have kept pace with other developments of modern times and modern demands; or, rather, I should say that this improvement or development has been so slow in presenting itself at all, that it is but during the last ten years that the question of modern building construction has been fairly taken up. This is a diversion, but not so much of a diversion, for it means that the structural element of a Coliseum would be represented to-day by a steel skeleton, the stone work taking its place as a medium of expression of character, architectural or decorative. And may I here be permitted to make a reasonable deduction, that this being accomplished at one-fourth the expense of a Coliseum, or a Temple of Jupiter Olympus, we might have four temples to-day, or public libraries, art galleries, or museums for the same outlay of money.

It is a fact that the use of stone, as commonly practiced, precludes its use in ordinary structures. A marble or stone building is in America to-day an incident, while with a more economical form of façade construction the use of stone might be much more general for we have many beautiful varieties of good stone in abundance in all parts of the United States.

I was the architect for the public library building in Stockton, Cal., the façade of which was built of white marble. It was built in line with the suggestion I have just made. The structural walls were of brick, the façade merely being of marble. The result, which, by the way, I hope often hereafter to see accomplished, is a frontage of 200 feet of unblemished stone where might have been an inferior material. The saving in the cost of the façade was practically 50 per cent.

It is not intended at this time to further follow the subject of the released façade construction, for to this subject I hope to confine myself in a later article with the purpose of pointing out the possibilities in the use of a façade released from the structural wall and the sincere conviction that it means good to the stone trade through a broader use of stone.

John Cotter Pelton.

OVERWHELMING TESTIMONY OF ROCKS.

IMMENSE progress has been made by scientists during the last century in reaching demonstrable conclusions regarding the origin of man and animals of a lower species. A certain harmony of opinion has been attained as a result of the investigation of fossil remains, but the deductions are yet so incomplete and the known facts so insufficient that it is probable the war of theories will break through this temporary truce at no distant day. An interesting résumé of the advancement made in the study of the remains of former life on the earth is contained in an article by Dr. Henry Smith Williams, in *Harper's Monthly* for April, entitled: "Paleontological Progress of the Century"—"paleontology" having been accepted as the defining term for this science of investigating the early life history of the globe.

It is here brought out that until near the close of the last century the "gigantic mausoleum," by which the author aptly describes the earth's crust, had furnished only relics for the cabinets of a dilettante, or at most had raised a wondering question in the mind of a philosopher. The marvelous story of the past was so confused by the misconception of scientists that its real import did not begin to dawn on the mind of man until William Smith, the English surveyor, brought to the work of investigation a tenacious memory and a wealth of common sense—two faculties which served to inject a form of order into what had only been considered an inexplicable chaos. After exhaustive researches he discovered the fact that "the fossils in the rocks, instead of being scattered hap hazard, are arranged in regular systems,

so that any given stratum of rock is always labeled by its fossil population; and that the order of succession of such groups of fossils is always the same in any vertical series of strata in which they occur." Thus he found that if a certain fossil underlaid another certain fossil in any given region it would never overlay it in any other region.

When Smith had established the uniformity of these phenomena as far as he was able to investigate, he drew the conclusion that "the earth had had successive populations of creatures, each of which in its turn had become extinct." The theory of Smith aroused bitter and almost universal antagonism, the generality of men holding to the traditional belief that the fossils had been swept into their present positions by the Noahian deluge. But a contemporary of Smith in France named George Cuvier, renowned as a scientist, in the course of his own original studies arrived at the same conclusion as Smith, that extinct forms of animals were represented among the fossils, and that, moreover, these creatures had lived and died where their remains were found and had not been swept about by any ancient deluge.

Cuvier's reputation for learning won for the announcement of his discoveries at least respect, which had not been given to Smith, and when Dr. Buckland, in 1821, made some discoveries of huge fossils in England which confirmed Cuvier's claims, the popularity of the general theory began to grow. There were yet men, like Granville Penn, who clung to the old idea that "the deluge had dissolved the entire crust of the earth to a paste, into which the relics now called fossils had settled." The caves, according to this idea, were only great air bubbles formed in the mass when the waters receded and the paste hardened. But skepticism gradually receded before a vast array of corroborative phenomena until it became the accepted belief that "numerous populations of creatures, distinct from one another and from present forms, have risen and passed away, and that the geological ages in which these creatures lived were of inconceivable length."

Following the acceptance of this belief arose a contention as to the manner of the termination of each of these species. For a long time the catastrophic theory obtained, namely: That vast floods removed the successive series of animals, but it was a necessary adjunct of this theory that the new form of animal life started at the same time, so that it was really believed well on into the century that these new forms of life began at such times practically from nothing.

This was too absurd a proposition to be entertained long in this century, and Charles Lyell, the famous Scotch geologist, was one of the first to abandon the idea after the appearance of Charles Darwin's "Origin of the Species," in 1859. This epoch-making work started scientific thought on the "transmutation" course until it won over nearly all original objectors to the belief that the various series of animal life were the outgrowth one from

the other, and that no great catastrophes had intervened to define their boundaries. With this theory well started scientists began to see how all the phenomena served to verify it and how it filled the ugly gaps that had made all previous propositions in turn untenable. Coincident with the promulgation of Darwin's theories arose an interest in the prehistoric ancestors of the human race, resulting in the discovery of traces of existence back beyond the iron and bronze ages, "through a neolithic or polished stone age." It is confidently predicted for future investigators that the "most ancient of our recognized progenitors will be modern compared to those generations that represent the real childhood of our race."

The battle over the meaning of the fossil records has reached a truce on the conclusion that "to doubt evolution to-day is to doubt science; and science is only another name for truth." But, as Darwin pertinently says, the record is only trivial compared to the whole fossil contents of the earth's crust, and there may be vast and astonishing revelations left for the coming century to make.—*Chicago Tribune.*

DIFFICULTIES IN THE MARBLE BUSINESS.

IT was once said by a keen observer of men that the marble trade must be a peculiarly depressing business, for he had never yet come across a man with a happy face engaged in it. We are inclined to doubt this sweeping assertion; but certainly the troubles and trials in connection with this particular business are greater than those which fall to the lot of most mortals.

To begin with, the nature of the material in which he trades is a source of perpetual anxiety to the dealer. He never knows what a block will turn out until it is opened, and with regard to the white marbles especially, their clear texture shows every mark which nature has set upon them, and this creates a position full of many difficulties. There are some people who never will understand that it is nature and not the quarryman who is responsible for the marking of marble; and nature is a somewhat capricious manufacturer. She abhors sameness, and infinite variety always accompanies her handiwork. The manufacturer of a piece of cloth can be sure that one yard of the material will be the same in texture, in weight, and in color, to that of other yards on the same roll, but the quarry owner and the marble merchant are not in this happy position.

"Pure statuary," for instance, is frequently inquired for, and by it is sometimes meant statuary of a pure white without marking of any sort. Probably a block of marble which would answer such a description is not in existence, and never has been. Absolutely pure carbonate of lime may be obtained by a chemist in the form of a beautiful white powder, but it cannot

be obtained direct from nature's own laboratory. The lime is always found mixed more or less with other ingredients, and these form the marks and veins, which, if man could be the manufacturer instead of nature, might possibly be eliminated. Then there is the purchaser who asks for bastard statuary without mark. These are none so few as some may think. They belong to two classes. One, those who are altogether ignorant of the trade, and terms used in connection with it, and the other those who, knowing the trade and its terms, say one thing and mean another. What these last really mean is first quality statuary at second quality price, or in other words a shilling for a threepenny bit.

The careful selection of Sicilian used for monumental purposes cannot be too much insisted upon; but here texture, and weather-resisting properties, are of infinitely more importance than mere color or marking. Especially in this climate marble will rapidly disintegrate unless it be of a fine close texture, even grain, and its chemical composition is such as will insure its preservation against the assaults of our rigorous climate. Here again the difficulties of the quarryman and merchant are considerable. Pure carbonate of lime is rapidly disintegrated by the weather, especially near towns where there is frequently more or less of sulphuric acid in the atmosphere; a good weather stone cannot therefore be white, for the whiter a marble is the more pure is the carbonate of lime of which it is composed. But the color of the chemical constituents which will preserve the carbonate of lime against the weather is the very thing which is frequently objected to, by those who fail to recognize that a weather-resisting stone for memorial purposes is of the first importance, and that all marble bleaches by exposure.

With colored marbles the difficulty is of another kind. In this case the freaks of nature in points of marking are little objected to, but another demand is made, which the quarry owner is unable to supply. In specifications we frequently read that colored marble is asked for perfectly sound and free from defects of any sort. There is very little colored marble in existence which will answer such a description. It is not too much to say that all colored marble is more or less defective from the point of view of those who style anything but a perfectly homogeneous material a defective one. Indeed this must be so when we consider the nature of the case. Colored marbles are formed either by the cementing together of various fragments of different colored limestones under great pressure, thus forming what is known as brecciated marbles, or by the injection of variously colored foreign matters into cracks formed in limestone rock. In either case some portions of the material must be less sound than others. The very beauty of the markings and veinings is caused by this fact. A perfectly homogeneous stone may be sound, but it cannot be found with a texture diversified with variously colored veins and markings.—*Stonemason.*

THE ANCIENT CITIES OF THE OLD WORLD.

IN the preparation of this paper it should be understood that we must of necessity confine ourselves more particularly to the subject of Architecture than to other and perhaps equally interesting topics connected with their history, their development, and their commercial importance. The domestic architecture of these ancient cities has long since crumbled into dust and we can now only judge of their importance by the extent of their ruins, and by those imperishable monuments of their grandeur, their temples and their tombs. The subject of this paper, therefore, will be confined to those stupendous examples of ancient architecture: 1st, Egyptian; 2d, Assyrian; 3d, Chaldean, and, if space permits, Persian.

One of the oldest, if not the oldest city of the world, was Memphis. It is said to have been founded by Menes, the first historical king of Egypt. Menes was a native of the city of Thinis in upper Egypt. Egypt is divided naturally into upper and lower Egypt, the latter being that portion of the country which is formed by the delta of the Nile and which is subject to its inundations.

Upper Egypt is a valley of greater or less breadth on both sides of the Nile and extending to rocky and barren ridges which separate the valley from the deserts on either side. This valley is above the annual inundation of the river, and is therefore not as fertile as lower Egypt. It is quite impossible to conjecture the duration of the prehistoric age in Egypt. A French writer of considerable note has suggested that at least 4,000 years may have elapsed before the beginning of the first dynasty.

Egyptian mythology contains no allusion to the flood, nor does it seem to have any connection with the Mosaic narrative in reference to the human race. Thus the Egyptian ideas of their prehistoric age have a strange isolation by the side of those of most other nations of remote antiquity which agree in one or more particulars with the Mosaic narrative. The traditional age in Egypt is extremely obscure. Its written history begins with the first dynasty variously computed to be from 4,000 to 5,000 years before Christ. As before remarked Menes was a native of Thinis (or This, as it was sometimes called), in upper Egypt, and consequently the first two dynasties were called "Thinite."

It is probable that before Menes gained the sovereignty of Egypt it was divided into two states or departments. When Menes came northward from his old capital of Thinis and set about founding a new city near the head of the

delta, his first undertaking was boldly to turn the course of the river. By dykes and dams he diverted the Nile from its channel beside the Libyan mountains so as to form a barrier between the new city and the tribes of the east, and on the land thus secured he built the city of Memphis. We are told that there were palaces and temples and schools and beautiful squares and streets in this new city of 6,000 years ago; that there was a famous citadel, a fine port on the Nile, and in later days a special quarter for the Phœnician traders who brought their merchandise to Egypt.

So large was the city that even in its decline it was half a day's journey to cross it from north to south. For 5,000 years it was the seat of learning and until Alexandria was founded it was the metropolis of lower Egypt. It is said that Menes founded the great temple of Ptah at Memphis, and there can be no doubt that the seat of government was soon after removed to that city. History tells us that Menes made laws, waged successful wars, and that after a long reign of sixty-two years he was killed by a hippopotamus. All this has a perfectly historical aspect. Only a legislator and warrior and so mighty a hunter, could have set upon a stable basis the long lasting fabric of Egyptian polity. The city of Memphis has been so utterly dastroyed that it is almost impossible to determine its location. "'Till very recently," says Ferguson, "no temples have been discovered which could with certainty be ascribed to the age of pyramid builders." One, however, was excavated a few years since from the sand close beside the great sphinx in front of the second pyramid. It was not remarkable for its size, its length being only about a hundred feet and its extreme breadth the same. The principal chamber is in form of a cross and is supported by piers, simple prisms of syenite granite without base and supporting architraves as simple as themselves. The roof of this chamber has entirely disappeared, but was no doubt of the same material. The walls are generally wainscoted with immense slabs of alabaster, or with syenite beautifully polished, but with sloping joints and uneven beds—a form of masonry not uncommon in that age. No sculpture or inscription of any sort is found on the walls of this temple. No ornament or symbol, nor any image in the sanctuary. Statues and tablets of Cephrenes, the builder of the second pyramid, were, however, found in the wall and places clearly showing that it belonged to his time. There being no image and no inscription it remains somewhat doubtful to whom or to what purpose it was dedicated. Its position at a distance of only sixty or seventy feet from the sphinx renders it probable that it belonged to that group.

This temple is perhaps the simplest and least adorned temple in the world. All its parts are plain, straight and square without a single moulding of any sort, but they are perfectly proportioned to the work that they have to do. They are pleasing and effectively arranged and have all the

lithic grandeur which is inherent in large masses of precious materials. The early Egyptians built neither for beauty nor for use, but for eternity, and to this last they sacrificed every other feeling.

Abd-El-Latif, of Bagdad, a learned physician and traveler who visited the site of Memphis in the beginning of the thirteenth century, thus describes it: "Its ruins still present a crowd of wonders that bewilder the intellect and which the most eloquent of men would vainly attempt to describe. The more one considers the city the greater grows the admiration it inspires, and each new glance at its ruins is a fresh cause of delight. Scarcely has it given birth to one idea before it suggests another, still more marvelous, and when you believe you have thoroughly grasped it Memphis at once convinces you that what you have conceived is far behind the truth." This learned traveler records with indignation the irreparable destruction wrought by "people without sense" in their pursuit for supposed hidden treasures, how they mutilated the statues, bored holes, wrenched off metal work and split up monoliths, in their hope of discovering hidden wealth. And when treasure was no longer expected, a worse thing came upon the monuments of Egypt; they were used as building materials for the walls and mosques and citadel of Cairo. Columns and slabs were carried over the river to the new capital. The splendid masonry which had stood unshaken for five thousand years was used for the beautiful but unstable monuments of Arabian art, and the wonderful ruins that excited the admiration of the old traveler of Bagdad have entirely vanished. Of all that splendor and beauty nothing now remains. As we wander among the palms that fatten on the site of Memphis, a few fragments of what may have been a temple, and the great half buried, half drowned Colossus of Rameses II. are all that remain to remind us of one of the oldest and most populous cities of the world.

Thinis, or This, the birthplace of Menes, having been destroyed, a new city known in ancient history as Abydos was built on its site. Crude brick remains are all that can now be seen of Thinis, and Abydos, its successor, belongs to past Memphite times, and forms a fitting prelude to the study of Thebes.

Abydos is noted in history as having been the burial place of the head of Osiris. It is not necessary for our purpose for me to repeat here the strange myths of the death and burial of Osiris, only to observe that his body after having been cast upon the shore by the sea was possessed by his false brother Typhon, who cut it into fourteen pieces and scattered them over the land of Egypt; that Isis the faithful queen of Osiris, sought diligently for the severed remains, and finding them buried each piece where it was found; that the head having been found at Abydos was buried there.

In the mythology of Egypt, Osiris comes back to reign with Isis, and the conflict between Osiris and Typhon is renewed and was made to symbol-

ize the struggle between spiritual and intellectual, as well as physical light and darkness, the fight between life and death, till the resurrection of Osiris became the type and symbol of the immortality of the soul.

To every pious Egyptian the story of the risen Osiris was a presage of his own resurrection, and though like the god his body must be buried in the sand of the Western desert, like him too shall he rise and triumph over death.

Abydos is famous for the palace of Memnon and the temple of Osiris, the remains of which are still to be seen. Seti I. was the founder of the principal temple and Rameses II., his son, completed it and added a second fane of his own. The older temple of Abydos is therefore contemporaneous with the oldest temples of Thebes and the memorial chapels of the nineteenth and twentieth dynasties, or from 1,200 to 1,500 years before the Christian era.

Architecturally, Abydos is the predecessor of Thebes. Experiments, like the terrace temple of Queen Hatasu, and the great collonade of Amenaph III., at Luxor, showed that the architects of the eighteenth dynasty had not yet agreed upon a fixed order of courts and chambers; and Abydos is proof that Seti, of the nineteenth dynasty, had a different idea of temple forms to those of his forerunner and successors. A recent visitor to this ancient city writes as follows: "The seven aisles ending in seven pictured chapels are unique in Egyptian architecture, though Seti's other temple at Kurnah bears a certain resemblance to this arrangement. For a small temple nothing could be more beautiful than this seven-fold avenue of columns and portals. And here the beauty is increased by the remarkable preservations of the whole temple roof, walls and pillars, and by the unrivaled charm of the sculptures which cover the walls and columns. Not only are they in an unusually fine state of preservation, but they are evidently the work of a supreme artist. Unless it be the sculptures in the tombs at Sakkarah, there is nothing in Egyptian glyptic art at all comparable with the wall chiseling at Abydos.

"The famous figure of Seti, offering a little statue of the goddess of Truth, to the seated Osiris, is matchless, and its pure white surface greatly enhances its beauty. All of the old sculptures are truly magnificent. There is one of Seti and Rameses taming a bull which is full of power, and in the passage next to this is the tablet of Abydos, wherein is engraved all the names and titles of all the kings of Egypt from Menes to Seti I., each of whom is represented, uniform in aspect sitting on his hams, beneath his name, while Seti himself, in colossal contrast, and Rameses his son, of more moderate proportions, offer libations to their assembled ancestors." Near by is a mound where it is pretended the head of Osiris is buried.

Without stopping to consider the temple at Dendara, which was built during the reign of the Ptolomies, we will proceed at once to Thebes, the

far-famed capital of upper Egypt, the second great city of ancient Egypt, the ruins of which extend on both sides of the Nile a distance of several miles. A recent visitor says that "In all the long course of the Nile there is no site that can compare with Thebes." The natural beauty of Thebes is not, however, in the eyes of most people its chief title to admiration. Its girdle of hills incloses not only one of nature's masterpieces, but some of the most marvelous achievements of human genius, skill and perseverance. There are more than twenty temples at Thebes, as many—that is to say—as all the rest of the surviving temples of Egypt put together, and in variety of design, grandeur of scale, and richness of decoration, as also, unhappily, in the ruthlessness of their ruin, they have no rivals. Many will prefer, for perfection of plan and comparative preservation, such exquisite examples of Ptolemic art as the temples at Edfû and Dendara. The design and the matchless sculptures of Abydos enthrall the admiration of others, while for a bold and captivating realism in the wall paintings, combined with an almost incredible massiveness in the masonry, the buildings of the Memphite empire stand without a peer. But Thebes has something of all these, and something more. It has the massiveness of Memphis applied to columns and roofs and colossi, instead of square blocks of stone. It has graphic wall sculptures less natural and vivid, no doubt, than Sakkarah, and without the extraordinary, almost Greek purity of Abydos, but still vigorous and artistic, and representing, moreover, not merely man's domestic life and country pursuits, but the victories of the greatest kings of antiquity and the erection of the most magnificent of ancient monuments, the works and wars of conquerors."

Like Memphis Thebes has vanished utterly from the face of the earth. Like Memphis also Thebes has left behind monuments of its religion which three and four thousand years of neglect and willful destruction have not entirely obliterated. The city of Thebes has vanished because it was not built to endure. The ancient Egyptians laid no store by their dwelling houses. They regarded life only as a halting place on the journey to the next world, and their abode here was too transitory to be worth elaboration.

The monuments that survive are those that were built not for this life but for eternity. The palaces of Rameses have vanished, but the monuments he built for his soul's welfare bear testimony to his power and wealth in every degree of latitude from the Mediterranean Sea to the second cataract of the Nile.

What we now see of Thebes, the monster ruins that cover so immense a space, represent but a fraction of what Thebes once had been. Of its temples not one is entire. Karnak is a heap of ruins, fallen columns, broken obelisks, walls and roofs thrown down. Luxor is half buried and in part destroyed. Kurnah is in terrible decay; the greater part of the Rameseum

has disappeared, the temple of Amenaph has entirely vanished except its two colossal sentinels, and how many other temples of which we know nothing have gone without leaving a trace of their former glory it is now impossible to determine. Of all this great metropolis, this mighty capital of the victorious Amenaph, of Thothmes, and of Rameses, which could send into the field twenty thousand armed chariots, absolutely nothing remains—not a trace of a wall, hardly even a mound of rubbish. Time will not permit us to enter upon a careful description of the sacred architecture of the Egyptians. The temple, or sacred architecture of the ancients must form a topic for a future paper.

Though the dwellings of the ancient Egyptians were not comparable with their public edifices, they were not altogether devoid of splendor. In Thebes, according to Diodorus, houses were in some cases of four and five stories in height. They were regular in plan, the rooms usually occupying three sides of a court-yard. The court was sometimes common to several houses. Large mansions were detached, having often different entrances on their several sides with portals similar in form to those of their temples. The walls and ceilings were richly painted and the latter formed into compartments with appropriate borders. Some of their villas were on a very large scale, laid out with spacious gardens and watered by canals from the Nile.

We will now consider the second division of our subject, Assyrian architecture, or the ancient cities of Assyria. The early history of Assyria, like that of all ancient countries, is hidden in impenetrable mystery. The name comes, it is said, from Asshur, a son of Shem and a grandson of Noah. He was probably a leader in one of the early migrations, and with his followers and their flocks and herds settled on the east bank of the river Tigris. He was deified and recognized as the tutelary divinity of the country occupied by the descendants of the clan of which he was the chief.

The prehistoric period covered by the mythology of the country is about 34,000 years, while its actual history begins about 2,500 years before the Christian era when, according to the scriptural narrative, Nimrod established his reign in Babel and Erech, in the land of Shinar, out of which land went forth Asshur and builded Nineveh, and the city of Rehobath, and Calah, all cities on or near the upper Tigris.

From this time, for fully one thousand years, there is no record of Assyria in the Hebrew writings and down to about 1850, when the inscriptions of Nineveh and Calah were unearthed and deciphered by Botta, Leyard and others. There was absolutely nothing known of the true history of this great empire which lasted more than a thousand years, except as it was for a brief space connected with that of the kingdoms of Israel and Judah. Ninus is said to have been the founder of the city of Nineveh. He was

probably a descendant from Asshur, the traditionary founder of the Assyrian empire.

In the Assyrian inscriptions Nineveh is also supposed to be called the "City of Bel." The city flourished, filled its place in history, and had become an almost unknown heap of ruins 400 years before Christ. Though Alexander the Great fought the battle of Arbela in its immediate vicinity, yet none of his historians allude to the ruins of Nineveh. Huge mounds apparently of mere earth and rubbish covered its site, the most important of which are known as the mounds of Nimrud, of Koyunjik, of Selemiyeh, of Nebi Yunus, of Keremlis, and of Khorsabad.

The first accurate description of the plan of these ruins was given by Claudius James Rich, the English East India Company's political agent at Bagdad. He made a survey of the ruins in 1820, which was published after his death.

In 1843 M. Paul Emile Botta, French Consul at Mosel, turned his attention to the mound Khorsabad, where he soon laid bare the ruins of a magnificent palace which bore evidence of having been destroyed by fire. He found among the remains a series of apartments paneled with slabs of coarse gray alabaster on which were sculptured in bas relief figures of men and animals, with inscriptions in the cuneiform characters.

In November, 1845, Austen Henry Leyard, an English traveler, began excavations in the mound at Nimrud, which he continued till April, 1847, with great success. In the three mounds of Nimrud, Kayunjik and Kharsabad the most of the remains of ancient sculptures and buildings have been found.

The mound of Nimrud contains several distinct edifices, erected at different times, material for the construction of the latest having been taken from an earlier building. In general plan the ruins consist of a number of halls, chambers and galleries paneled with sculptured and inscribed slabs and opening one into another by doorways, generally formed by pairs of colossal human-headed and winged bulls or lions. The exterior architecture could not be traced.

The pyramidal northwest corner of the mound rises above the ruins of a basement 165 feet square walled to the height of 20 feet with sun-dried bricks, and faced on the four sides by blocks of stone, carefully squared, beveled and fitted together. This stone plinth corresponds exactly with the description given by Xenophon of the deserted city on the Tigris which he calls Lorissa, and is surmounted by a superstructure of bricks as he describes, the burnt brick being generally inscribed.

The largest palace hitherto explored stood at the southwest corner of the mound at Kayunjik. It was built by Sennacherib, about 700 years before Christ, and had an extent of nearly one hundred acres. About sixty courts,

halls, passages and rooms have been discovered. Some of the halls were 150 feet square, and one passage is 200 feet long. All are paneled with sculptured slabs of alabaster.

The Assyrian palaces were generally alike in plan, construction and decoration. They were built upon enormous platforms raised about forty feet above the plain, either by heaping up the dirt and rubbish or by masonry of sun-dried bricks. The platforms were faced with stone and were ascended by broad flights of steps.

The palaces themselves were constructed principally of sun-dried bricks, though kiln-burned bricks were used for the solider parts and a coarse alabaster quarried near the city was used for ornament. The discoveries of Nineveh appear to have been mostly ruins of palaces. The walls of these buildings were generally about fifteen feet thick and were lined with sculptured alabaster slabs from nine to ten feet high, from three to four feet broad, and about eighteen inches thick. On the sculptured figures were inscriptions recording the exploits of the kings by whom they were erected. The apartments were high and above the slabs were plastered and painted, or were faced with bricks coated with enamel of elegant designs and brilliant colors. Ivory, bronze, and the famous cedar from Mt. Lebanon were also used for decoration, their beauty being heightened by gilding and painting. "The interior of the Assyrian palace," says Mr. Leyard, "must have been as magnificent as imposing."

The stranger who for the first time entered the abode of an Assyrian king was ushered through a portal guarded by colossal winged lions or bulls of white alabaster. In the first hall he found himself surrounded by the records of the empire. Battles, sieges, triumphs and exploits of the chase, the ceremonies of religion were portrayed on the walls, sculptured in alabaster and painted in gorgeous colors. At the upper end of the hall was the colossal figure of the king in adoration of the Supreme Deity, or receiving from his attendant the holy cup. The stranger trod upon alabaster slabs each bearing an inscription recording the titles, genealogy and achievements of the great king. These edifices were great national monuments and he who entered them might read there the history and learn the glory and triumphs of the nation.

They served at the same time to bring to the remembrance of those who assembled within them on festive occasions, or for the celebration of religious ceremonies, the deeds of their ancestors and the power and majesty of their gods. The palaces of Nineveh appear generally to have been destroyed by fire, which however could not injure the incombustible and massive walls of the lower part of the first story. These with their sculpture were probably at once buried by the falling in of the upper stories, and the ruins were in time wholly concealed by the accumulation of rubbish from the villages sub-

sequently built on them and by the mould of decaying vegetation through the course of 3,000 years.

Vases, jars, bronzes, glass bottles, carved ivory and mother of pearl ornaments, engraved gems, bells, dishes, earrings, arms and working implements have been found among the ruins, generally of elegant form and indicating a knowledge of the arts and a refined taste.

Enough has been discovered among the ruins of Nineveh to establish the fact that the Assyrians were at one time an educated and highly refined people.

We must pass from this interesting subject to the consideration of its rival, Babylon the Great:

In the consideration of Chaldean or Babylonian architecture you must not suppose that I shall be able to afford much instruction. The materials are scanty and the monuments though once stupendous are still more so. "If ever," says Keith, "there was a city that seemed to bid defiance to any predictions of its fall that city was Babylon. It was for a long time the most famous city of the Old World. Its walls which were reckoned among the wonders of the world appeared rather like the handiwork of nature than the workmanship of man." It is not our purpose to attempt a full description of this wonderful city. It was situated on both sides of the river Euphrates and about 275 miles south of the city of Nineveh.

These two ancient cities disputed the possession of the plain of Shinar, as the plain between the two great rivers Tigris and Euphrates was called. Their wars were frequent and fierce, and in the more ancient times the contest usually resulted in favor of the Assyrians. During the reign of Sennacherib Assyria reached the zenith of its power and military glory. This monarch conquered Babylon, "and pulled down, dug up and burned with fire the city and the palaces, root and branch, destroyed the fortress and the double wall, the temples of the gods and the towers of brick, and threw the rubbish into the river of Babylon." This destruction was so complete that little was left of the ancient city. The city was rebuilt during the reigns of Essar-haddon and Nebuchadnezzar.

The Assyrians were a very modest people, and hence only claim a prehistoric existence of 32,000 years before their written history begins. Not so with the Chaldeans, for they claim an uninterrupted monarchy of 432,000 years before the deluge, beginning with Alorus, of Babylon, and ending with Opartes, of Larankha, and his son Sisuthrus, the hero of the flood. The Chaldeans also modestly claim that Babylon was built on the site of the garden of Eden. I am inclined to the opinion that in this they must have labored under a mistake, for a recent traveler informs me that in passing up the river from the Persian Gulf to Bagdad, the site of the garden of Eden was pointed out to him. It was marked by a lonely fig tree whose

branches bore evidence of great age, and as if to identify that as the very spot on which the garden was located, a serpent (common to the country no doubt) peered from his nest in a hollow limb and watched the traveler with an anxious gaze.

It was under the reigns of Nebuchadnezzar and his successor that Babylon became the huge metropolis which was described by Greek historians and whose ruins still astonish the modern traveler. As previously stated, the city was built on both sides of the Euphrates. The two divisions of the city were connected by a massive bridge of masonry, strongly connected with iron and lead, and the embankments, to prevent inroads of the river, were formed of the same durable materials as the walls of the city. Herodotus says that the city itself was a perfect square, 480 furlongs in circumference, inclosed by a wall 335 feet high and 85 feet wide. The spaces between the 250 towers which were irregularly disposed along the wall were broad enough to allow a four-horse chariot to turn. Babylon is said to have had numbers of houses three or four stories in height and to have been regularly divided into streets running parallel with each other, the cross streets opening to the river. It was surrounded by a wide deep trench from the earth whereof square bricks were formed and baked in a furnace. With these cemented together, through the medium of heated bitumen intermixed with reeds to bind together the viscid mass, the sides of the trenches were lined, and with the same materials the vast walls above mentioned were constructed. At certain intervals watch towers were built and the city was entered by a hundred gates of brass. In the center of each of the principal divisions of the city a stupendous public monument was erected. In one stood the temple of Belus; in the other within a large strongly fortified inclosure the royal palace. The temple was a square pile each side being two furlongs in extent, or about 1,320 feet square. The tower erected on its center was a furlong in breadth and the same in height, thus making it higher than the largest of the Egyptian pyramids. The tower consisted of seven successive platforms, with receding steps very similar to the teocallis of Mexico, the whole being crowned with a bronze statue of the god Belus, forty feet high.

The palace, serving also as a temple, stood on an area of one and one-half miles square, and, according to Diodorus, was surrounded by a circular wall which was decorated with sculptured animals resembling life, painted in their natural colors, on the brick of which they were depicted and afterward burnt in.

The materials with which the city of Babylon was built were entirely different from those used in the city of Nineveh. It should be remembered that Babylon was built in the midst of a vast plain far removed from the surrounding hills. This plain is an alluvial deposit consisting of a rich fine clay brought down by the great rivers Tigris and Euphrates. The Baby-

lonians were content to make use of the material which they found on the spot. With the tenacious clay of the plain they mixed chopped straw and formed it into bricks, and with bitumen and other substances found in the neighborhood they made an excellent cement.

A knowledge of the art of making glaze and colors enabled them to cover their bricks with a rich enamel, thereby rendering them equally ornamental for the exterior and interior of the edifices. The walls of their temples and palaces were also coated with plaster which judging from their cement must have been a very fine quality., and upon these walls were painted historical and religious subjects.

Images of stone were no doubt introduced into their building, but such sculptures were not common; otherwise some remains of them would have been found. Doubtless some stone entered into the construction of their more important edifices, but as such material could only be obtained from a great distance its use must of necessity have been very limited. Although the building materials employed in the great edifices of Babylon may seem extremely mean when compared with those employed in the stupendous palace temples of Egypt, yet the Babylonians appear to have raised with them alone structures which excited the wonder and admiration of the most famous travelers of antiquity.

I will close this brief sketch of ancient Babylon by quoting a description of its hanging garden, as given by a celebrated Greek writer, Didorus Siculus, the only author who speaks minutely of this wonder of the world: "This garden which was square in form had a length of 400 feet on each side. It was reached by steps rising in terraces like an amphitheater, these terraces being supported by pillars of which the tallest supported the garden tself. The platforms of the terraces were composed of blocks of stone 16x4 feet, covered with a layer of asphaltum and rushes, then a double layer of cemented bricks, and finally with sheets of lead to prevent the water from filtering through. Upon all this was laid a depth of earth sufficient to receive the roots of the largest trees, and this artificial soil was then filled with trees of the rarest and most beautiful kinds. The columns rising gradually allowed the light to penetrate through the interspaces and gave access to the royal apartments numerous and beautifully decorated. One of the columns was hollow from summit to base and contained hydraulic contrivances for bringing up a vast amount of water from the river below. The whole had the appearance from a distance of a mountain clothed in verdure."

This great work, it is affirmed, was effected by Nebuchadnezzar to gratify his wife Anytis, daughter of King Astyages, who it is said pined for the groves and hills of her native Media.

After the destruction of Nineveh Babylon rapidly succeeded to the proud position so long held by the capital of Assyria. Under Nebuchadnezzar she

acquired the power forfeited by her rival. The bounds of the city were extended, buildings of extraordinary size and magnificence were erected. Her victorious armies conquered Syria and Palestine and penetrated into Egypt. Her commerce, too, had spread far and wide from east to west and she became a land of traffic and a city of merchants.

But her greatness as an independent nation was short lived. Scarcely a half century elapsed from the fall of Nineveh till Belshazzar, the king of the Chaldeans, was slain and his kingdom divided and given to the Medes and Persians. From one disaster to another Babylon sunk till it became but a name—a memory. Where now are its walls, its temples, its hanging gardens, its palaces? The modern traveler in vain seeks a vestige of them. Nothing guides him to any discovery; not even their ruins exist, and in the midst of the far-stretching desert, across which once glittered the magnificent city of Semiramis, it is by accident that he detects a few shapeless mounds which indicate the place where once stood this proud capital of the ancient world. The great Euphrates still flows on its lordly way to the sea, but its magnificent quays, so much admired by Herodotus, have utterly vanished and in their stead there is but a little cluster of Arab cottages which does not even in name seek to perpetuate the memory of Babylon.

Cyrus K. Porter.

LETTERING MARBLE MONUMENTS.

TO gild letters on marble, use white lead mixed with fat oil for painting the letters, and, when set, size with japanner's gold size, and when sufficiently dry, or what is termed tacky, apply the gold-leaf with a camel-hair gilder's brush, and burnish up with a thick, soft camel-hair brush. If the marble is polished, rub off with dried cuttle fish. Leaded letters are formed in different ways. One method is to fill them after they are cut, and holes drilled in different parts of each letter to form a key, with molten lead. Another method is, beat lead wire into each letter. This wire may be had ready for use. Another method is, after the letters are cut and drilled as aforementioned, to cut off with shears a piece of sheet lead not quite the size of letter and lay it on the letter, and beat it into the letter carefully with hammers, and pare off superfluous lead with a sharp three-quarters joiner's chisel. You have then a perfectly solid letter, no joinings of the lead, as is the case if wire is used—at least, in most letters. It is all right in such letters as I, U and V, etc.—*Stonemason.*

"STONE is worth all you ask for it in any home. It is very instructive."—*S. J. Reed, Easton, Pa.*

*GEOLOGY FOR QUARRYMEN—V.

RELATIONS OF CLEAVAGE AND FISSILITY TO BEDDING.

WHERE a rock series is composed of layers of different lithological character, and is in the zone of combined fracture and flowage, the deformation includes the development both of cleavage by normal plastic flow and of fissility in the planes of shearing, in both homogeneous and heterogeneous rocks, and perhaps of all gradations between the two. The beds in the heterogeneous rock may be each approximately homogeneous. There is necessary rearrangement within the beds as well as readjustment between them. Therefore the rearrangement within the beds, in so far as it is not affected by the readjustment between the beds, will tend to produce cross cleavage and cross fissility, while the readjustment between the beds will mainly be by parallel slipping, and will tend to produce parallel cleavage and parallel fissility.

In passing from the limbs of the folds toward the crests or troughs, parallel readjustment becomes less and less important, and normal plastic flow or fracture along the shearing planes becomes more and more important. At the arches and troughs the thrusts for a given bed are approximately equal, in opposite directions, and when deeply enough buried in its entire thickness is under compression. The direction of least resistance is vertical. Therefore, the conditions which here prevail are those of the formation of cross cleavage and cross fissility. It follows that in heterogeneous rock strata, parallel structures may prevail on the limbs of the fold, and cross structures on the crests and in the troughs. At intervening places may be found all the complex effects of the interaction of the two (fig. 133). In many cases where there is almost perfect accordance of primary and secondary structures on the limbs, and the rocks are so crystalline that the two can not readily be discriminated, at the crests and troughs both structures may readily be seen intersecting each other.

Formations are but divisions of rock masses greater than beds which are roughly homogeneous. In each formation, considered as a whole, cross secondary structures will usually be produced, while at the contacts between the formations, where major readjustment is sure to occur, nearly parallel structures may be found. In the discussion of each separately it has been seen that in the cases of extreme folding the relations between the

*Reprinted from Sixteenth Annual Report U. S. Geological Survey.

different secondary structures and bedding are nearly the same, and therefore that cleavage and fissility developed under each of the laws will merge together, and both be approximately parallel to the reduplicated beds. They are all brought into nearly parallel positions, just as are pebbles in the folding process. In order that this should be done, it is plain that there must be such extreme rearrangement of the material that it could not inaptly be compared with kneading.

In rock masses in which the alternating layers of different strength are not beds, the principles of the development of cleavage and fissility are the same as in the heterogeneous bedded rocks. The different layers may be due to secondary structures. They may be due to the flowage of igneous material along primary or secondary planes of weakness, or to secondary water-deposited impregnations along such planes. They may be due to heterogeneous injections. In all these cases, as in any other, the stronger beds will to a certain extent control the movements. The accommodations will occur along the layers when folded, and there will be a tendency for cleavage and fissility to develop parallel to them (Pl. I).

The more unequal the layers in thickness and strength, the more likely is the major accommodation to take place parallel to them, and thus produce cleavage and fissility which nearly accord with them. In proportion as the rocks approach massive ones, the law of cross structures prevails, but in a minor way readjustments along the laminæ may occur, and these laminæ still retain their integrity. In rocks as they occur in the field both tendencies are always present in all the parts, from the minute laminæ to the largest masses. Sometimes the first is

FIG. 133.—Parallel fissility on the limbs of the folds and cross fissility on the anticlines, and gradations between the two. After Heim.

The deformation is mainly by folding, but on the anticlines, where the material is partly relieved from stress, the deformation is partly by the multiple minor slips of fissility.

predominant, sometimes the second. If the lamination is not strongly marked the first tendency will control, although the lesser layers or laminæ of unequal strength may in a minor way control the movements (Pl. I).

Ordinary shale is a representative of rocks having minute layers of slightly different strength. Usually the average of the cleavage or fissility distinctly cuts the beds. The material yields to thrust by flowage or fault slips combined with minute puckerings. If the process be continued far enough the individual layers are folded upon themselves in a large number of parallel folds, nearly at right angles to or inclined to their original positions. Therefore, while cleavage does nearly correspond with the original

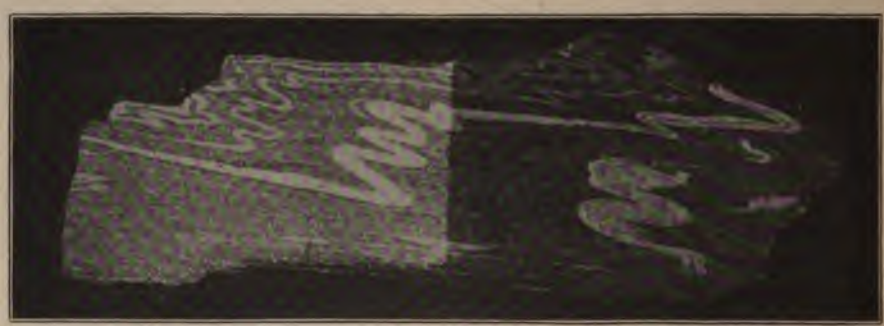


PLATE I.—GNEISS, WITH STRONGLY DEVELOPED CLEAVAGE, SHOWING MINOR PLICATIONS OF QUARTZ LAMINÆ, THE DIFFERENTIAL SHEARING MOVEMENTS WHICH THE ROCK HAS UNDERGONE, COMBINED, HOWEVER, WITH VISCOUS FLOW UNDER COMPRESSION.

The quartz laminæ show thinning on the limbs of the folds, and thickening at the anticlines and synclines.

beds, the particles have been so much deformed and rearranged, and the layers have been so far readjusted as to make the term bedding scarcely applicable.

Beds are particularly likely to largely control the direction of cleavage or fissility if the folds are monoclinal and overturned (fig. 134, March STONE). In such folds the major differential movements are along the longer limbs. Therefore the cleavage develops in a corresponding direction, being nearly parallel to the bedding on one limb of each fold and cutting across the bedding on the other, steeply inclined or overturned limb. As the area of outcrop of the steeper limbs is much less than that of the more gently inclined ones, the fact that the cleavage cuts the bedding on one side of each fold is very likely to be overlooked. As a result of the greater mashing thus developing cleavage or fissility the longer limbs of the folds are thinned more than the shorter limbs.

If for any cause cleavage be parallel to the bedding planes, as these are apt to be shearing planes in the zone of the fracture, the predominant fissility would be likely to be parallel to the bedding. The other direction of fissility would be transverse to the bedding, and might have a wider spacing. The first might be called fissility and the second joints.

In another case, after a cross cleavage has developed and the rocks have passed into the zone of fracture, the stresses may result in the development of fissility along two sets of shearing planes, one of them being controlled in direction by the cleavage, the other by the bedding. The more regular parting, parallel to the cleavage, might be called fissility, and the less regular parting, parallel to the bedding, might be called either

FIG. 134.—RELATIONS OF CLEAVAGE TO BEDDING IN MONOCLINAL FOLDS.

fissility or joints, depending upon its closeness. Whether the intersecting planes of fissility are at right angles to each other would depend upon the inclination of the cleavage and the bedding.

In regions of complex folding it is difficult to make accurate general statements of the relations of cleavage and fissility to bedding. However, as a result of the action of the various forces, a bed has a definite strike and dip, and the cleavage and fissility have definite relations to these. As there are rapid variations in strike and dip in regions of complex folding, it is to be expected that there will be variations in the directions and character of cleavage and fissility. *Charles Richard Van Hise.*

[TO BE CONTINUED.]

"STONE gives me more satisfaction than anything I know of."—*Jos. Stanistreet, Rockyhill, N. J.*

CORRESPONDENCE.

[Regular Correspondence STONE.]

NOTES FROM ABERDEEN.

To the Editor of STONE:

SIR:—The granite trade in this district continues, on the whole, to be fairly prosperous. A new quarry has been opened at Rubislaw by the Rubislaw Granite Company. The Rubislaw quarries, which have been worked for over a century, are, I may mention, now within the municipal boundary of the city, and the estate of Angusfield adjoining, lately purchased by the company, will be traversed by a number of new streets, and is being rapidly taken up for building purposes. The plant at these well known quarries includes ten steam cranes and three "blondins."

Comparatively little anxiety is felt here as to the new American tariff. Another failure has occurred in the American branch of the local monumental trade, making the tenth in that department within two years; that is to say 25 per cent., or a fourth of the whole branch. The trade is thus a dead loss, but its entire abolition would mean too much competition in other branches. I may mention, however, that a private syndicate is being formed among the granite manufacturers to supply themselves with rough stock at a uniform rate on the co-operative principle; and also to endeavor to raise the price of manufactured goods to a "living" level. The Aberdeen Granite Works are the only monumental premises in this city belonging to a limited liability company. At last annual meeting a dividend of 5 per cent. was declared, and the balance allowed of the final installment (£500) of goodwill of business being paid off, besides £1,000 being placed to credit of reserve and depreciation fund, and £106.9.6 being carried forward. £10,000 has also been repaid to the shareholders, at the rate of four shillings per share, in reduction of working capital, as authorized by the Court of Session.

The monumental trade generally in Aberdeen will benefit by this being the "Diamond Jubilee" year, though the orders yet to hand have been restricted chiefly to commemorative drinking fountains and memorial tablets for buildings. A granite pedestal for a sitting statue in bronze of Charles Darwin, the great naturalist, for his native town of Shrewsbury, is also under way at one of the Aberdeen works.

Various public works will be early contracted for here. The Light Railway commissioners on Friday last authorized the Great Northern Railway Company to construct a light railway from Aberdeen to Skene and Echt, and the same company will at next setting apply for leave to make a suburban loop to connect the light railway with their main line. The company gets three years to finish the light railway, and the total cost of the two lines will be about £250,000. The company has also got authority from Parliament to build at a cost of £30,000 a hotel at Ballater, the terminus of their Deeside line, and from its proximity to Balmoral Castle, a favorite resort of American visitors. Aberdeen Town Council has resolved to extend the sea-bathing station at Aberdeen, at a cost of £6,000 (including a swimming pond one hundred feet long), and as an experiment to erect workman's dwellings (for seventy-two tenants) at Urquhart Road, at a cost of £6,000, exclusive of site. The Imperial Government will also contract soon for

new head postoffice here, as the question of site will be settled almost immediately. Aberdeen Harbor Board is also to erect extensive additional sheds on the quays. Aberdeenians are engaged at present in the election of a new school board, which is to turn on the question of the site for a large elementary public school, a matter which is, by the way, also in the law courts. Further, there are a number of church extension schemes being matured.

The house in Broad street, Aberdeen, where Lord Byron lived when a school boy is to be demolished to make way for the extension of the University buildings. This has given rise to proposals to erect a granite or bronze statue of Byron in this city, and to utilize the stones of the house referred to in some form of memorial of the famous poet. No subscriptions, however, are yet forthcoming, other schemes having practically exhausted the city meantime.

As regards the University extension, the north terminal tower is now finished and the new south wing is being proceeded with. The Gray Friars church which is partly a pre-Reformation structure, is to be rebuilt on a new site in line with the terminal towers. The Mitchell Hall is considered the finest in Britain, and it and the Mitchell tower are great attractions to tourists. The authorities have appealed for additional subscriptions of £40,000 to complete the scheme, which will not only benefit the University, but effect a conspicuous street improvement.

A public park has been presented by one of the "royal tradesmen" to Cults, a pleasant Aberdeen suburb, as a commemoration of the sixtieth year of Queen Victoria's reign.

A dry dock, which will be sufficient for 170 fishing boats wintering in, has just been opened at Fraserburgh, Aberdeenshire. HEATHERBLOW.

Aberdeen, Scotland, April 13, 1897.

"A TOMBSTONE SCANDAL."

To the Editor of STONE:

DEAR SIR:—Under this heading, in your admirable issue for March, it is stated that in England, physicians have acted as agents for the sale of tombstones. There is not the slightest foundation for such a report. It would be impossible for a physician in this country to "trade" in anything. If he attempted such a thing he would not only lose his status in society, but his brother professionals would at once eject him from their institute. Their code of etiquette is very strict. A physician may not advertise, and he may not sue in our courts if his patients do not pay their bills. Tombstones and physicians are practically as far apart as England is from America, and in no possible way are they, or ever have they, been associated. Yours, obediently, HARRY HEMS.

Exeter, Eng., March 3, 1897.

A PERTINENT SUGGESTION.

To the Editor of STONE:

SIR:—I think if you could get the contractors to give you an account of lawsuits, points of controversy, interpretation of specifications, and finally, the opinion of the arbitration committee, or court, whichever it may be, I think it would have great weight for settling disputes that will arise in the future. I consider arbitration the quickest, most just, and safest way to pursue. One arbiter by the contractor, one by the owner, and the third selected by the first two. Yours, etc., JAS. FARRELL.

Covington, Ky.

[We would be pleased to have stone contractors act on this suggestion.—Editor STONE.]

"WHOLESALER" AND "MIDDLEMAN."

To the Editor of STONE:

SIR:—In your April number there appears an article entitled "The Middleman," which certainly gives but one side of the case.

The wholesale dealers are legitimately engaged in business. They not only have invested considerable capital, but the larger firms are engaged in manufacturing either at Quincy or Barre, or at both points, or are large quarry owners. As a matter of fact, it is the wholesale dealer who has built up the granite industry of this country. Fifteen years ago not one marble dealer in ten had ever bought a granite monument, while at the present time there is scarcely a dealer in monuments who does not spend ten dollars for granite to one for marble. It is estimated that the wholesale dealer has spent more than $100,000 in furnishing designs and samples, and thus educating the trade to a higher standard of art, and materially assisting and developing the granite business; and all granite manufacturers have reaped the benefit of such investment, either directly or indirectly.

In all other lines of business the wholesale dealer is universally recognized as a necessity, and this point was well illustrated by an article published a few years since in the *Cosmopolitan*, by Edward Everett Hale, entitled "Profit Sharing," and which should be read entire to be appreciated. In this article is recognized Capital, Enterprise and Labor. Capital is represented as an inert, lazy individual, who, if he does not nurse his enterprise, comes out "at the small end of the horn." Enterprise he pictures as an entirely different kind of a fellow. "He comes skipping around with stupid Capital's money. He plans out this paper mill, or that iron foundry. Enterprise brings in a wholly new factor. He is neither the idiot, Capital, nor is he the steady workman, and although he is abused, yet we all have to use him."

Mr. Hale credits Mr. Wm. B. Weeden, the distinguished historian and economist, as being the first to show that the most convenient and systematic working of all schemes and corporations required a frank recognition of Mr. Enterprise.

Mr. Hale wrote his story "Back to Back," illustrating this principle, and it was published by the Harpers at a time of great depression in the woolen manufacture, and Mr. Hale received at once three well-intentioned letters from capitalists who owned woolen mills, asking him to be the "Enterprise" who should carry on their mills on the principle advocated.

All the woes of the granite trade are laid at the doors of the wholesale dealer. There are several firms whom we have in mind, large manufacturers, and yet who receive more orders from the retail trade than they can execute at their own granite plants, and who place such orders with neighboring manufacturers, and yet they are called wholesale dealers, possibly because they also import granite.

The question occurs to us, "Who are the 'middlemen' referred to?" Jones Bros. have the largest manufacturing plant at Barre; Chas. H. More & Co. also are one of the largest manufacturers at Barre; R. C. Bowers Granite Company own and operate a quarry at Barre; Cook & Watkins manufacture at both Quincy and Barre; Wm. C. Townsend & Co. and Chas. Clements own, and have operated until within a year or two, a quarry at Quincy, from which the darkest Quincy stock was obtained. Mr. Townsend also at one time manufactured at Quincy, working something like one hundred men, we believe; E. C. Willison, until lately, manufactured at Quincy. And yet we suppose any of the firms mentioned above are classed as wholesale dealers.

There are but four or five firms, to the best of our knowledge, who do an exclusive jobbing business, and who do not manufacture, but import granite and statuary, while at Quincy alone there are more firms who job in granites produced outside of Quincy, and who claim to import foreign granites, than there are firms who are engaged exclusively in wholesaling.

Our own impression is that it is only a question of a few years of prosperous granite business, when the demand for a better standard of work will have become so apparent that all wholesale dealers will be obliged to manufacture in order to produce work of a character sufficiently good to compete. It will then be "the survival of the fittest."

Respectfully, COOK & WATKINS.

Boston, April 22, 1897.

A FIRST EPISTLE.

To the Editor of STONE:

SIR:—I saw an article in April number of STONE, page 492, in which you do the wholesale dealer an injustice. I claim that the wholesale granite business is a legitimate business. All branches of trade, including dry goods, boots and shoes, and many other businesses have their wholesale business, and I claim that you have no right to write about us the way you do, and you would be properly liable to damages. We are willing to be criticized if we do anything wrong, but you have no right to try to injure us the way you have in your paper, and I hope that you will apologize for the same. We have just as much right to do business as you have to publish your journal.

Yours truly, WM. C. TOWNSEND.

Zanesville, O., April 28, 1897.

A SECOND EPISTLE.

* * * * We think if we could create a kindly feeling between the wholesale dealers and retail dealers it would do more good than anything else that could be done. We claim that it is as necessary to have a wholesale dealer or jobber in the granite business as in the dry goods, boot and shoe, or grocery business. It enables small dealers to go into business that would otherwise have to work for some one all their lives, and it makes them more independent. The manufacturing business is a business by itself and the jobber enables them to dispose of their goods, and enables them to give their whole time to manufacturing instead of drumming up trade and paying salesmen on the road for selling goods, and all the necessary expenses of the wholesale business. The net profits of the jobber are so small that he has to do a very extensive business in order to make a living. We claim that if the retailers, manufacturers and the jobbers would all work together it would be better for all concerned. In this connection, will state that a great many retailers and trade journals think that the jobbers make large profits, and as I stated before the profits are so small that a jobber has to do an immense business to make anything above his living.

We claim that a journal has a right to criticise any person or business to a certain extent, but do not think that it can go so far that it will injure the business.

We trust you will take no exception to our former letter, and you may publish this letter or any part of it that you see fit.

Thanking you for courteous treatment, I remain, yours truly,

WM. C. TOWNSEND.

Zanesville, O., May 4.

In writing of the "middlemen" and "wholesalers" in the granite monument trade, in April STONE, we defined them as "the concerns that stand between the producer and manufacturer of granite monuments and the retail dealers." The writers of the letters printed above have clearly misinterpreted this and prepared criticism that hits wide of the mark set up by us. We will not use space in a direct reply to them, but will try to make the attitude of this journal toward the "Middleman" clearer to them. If, after reading our explanation, our good friends and correspondents still conclude

that they are under our censorial whip, let them strike back with all their might.

Who are the producers and manufacturers in the granite industry? Why, first, the quarryman, who may also be a manufacturer and wholesaler; and, second, the operator of a plant for the manufacture of the material, who may or may not be a quarryman or a wholesaler.

Our middleman, No. 1, is none other than the homeless and creditless jobber—the man who hustles for the orders of the retailer, or of customers in the retailer's bailiwick—and securing such peddles them among manufacturers, or among another species of "middlemen" we shall mention further on, for the best price he can get for them. He flourishes most liberally in the West and South.

Our middleman, No. 2, is the commission agent for foreign manufacturers as well as for home manufacturers. He has headquarters in one city, and a "branch" in several cities. He employs numerous sub-agents who traverse the territory of the local dealer. He cuts the life out of the trade of the latter by paring his commission and compelling the manufacturer to stand a shave or turn down the business. We regret to say that nowadays manufacturers can readily be found who will accept orders for work from this source on which there is but a very slight margin of profit, or practically no profit at all, because they are anxious to tide over the depression and keep their plants in operation. This middleman, having no costly plant to grow rusty from inactivity; no salary list that may not be suspended on the instant that it doesn't pay; no loss to fear from a relaxation of effort; who can afford to watch and wait, and is prepared to pounce upon the first prospect of getting an order, is not a bad fellow in good times, nor is he a good fellow in bad times. We think he is not essential, however, at any time. Manifestly, having nothing else at stake but his commissions, he is usually willing to earn a dime if it is impossible to earn a dollar. The real sufferer is the quarryman or manufacturer who has capital invested in a costly plant that must be kept in operation at any cost and who will attend and bid at this middleman's auction sale of rare orders. There are not many of this class of middlemen. We do not count Cook & Watkins and Wm. C. Townsend in the category, nor any of the firms mentioned in their correspondence. Every one of those firms have had, or have now, capital invested in the business that shows itself in tangible property that protects any obligation they might incur. Furthermore, they have been in business long enough to establish a reputation that is sufficient to indicate that they conduct their business on legitimate lines. Not so with our middleman No. 2 who has only a rented office, highly enriched stationery, no typewriter, a collection of stolen designs, superlative cheek and diminutive conscience as his entire outfit.

Our middleman No. 3 is a self-styled "manufacturer." He owns a kit of granite-cutter's tools. His ambition is to rise in the world, to be his own boss, and we admire him for that, but he ought to be known for what he actually is. He is not a "manufacturer," in the common acceptation of the term. He is an independent granite-cutter. The fact that he sets up a banker in a wood-shed or a blacksmith shop, and has credit sufficient to obtain a block of granite from a quarryman, and can pawn an order for a monument to the owner of a polishing machine, doesn't make him a manufacturer in a commercial sense. He advertises, without paying cash, in our middleman No. 4's newspaper, and ordinarily can be relied on by our middleman No. 1 to help out on any orders the latter may secure, that nobody else in the trade can be induced to execute. What show would any one have in getting a bill for damages from such "wholesalers?" This fellow is the worst specimen in the whole lot of middlemen with which the legitimate business of making and selling granite monuments is beset.

Our middleman No. 4 is the publisher of an alleged trade journal. He barters advertising space for finished stock and conducts a wholesale and retail trade in competition with his misguided advertisers and subscribers. While he is able to run a business of that sort successfully we don't think it is anybody's business to complain, except in pity of the fools who support it. It would be an uncommon display of upright business principles, however, if such a middleman refrained from price-cutting, or hesitated to "plug" a monument, and sell it for a perfect piece of work.

We trust we have made our diagnosis of the "middleman" clear to our readers and critics.

ALUMINA IN QUARRIES.

To the Editor of STONE:

SIR:—We note on page 522, April number of STONE, an article in relation to extraction of aluminum by an electric process from red building stone of Pipestone, Minn., which is claimed to contain a large percentage of aluminum (10.25 to 15.13 per cent.).

Some three or four years ago we had an analysis made of our marl, which lies between the layers of building stone in our quarry, thinking it might be of value on account of some of the properties it contains.

We inclose herewith a copy of the analysis.

Analysis of marl.

	Per cent.
Water	3.37
Carbonic acid (CO_2)	2.36
Silica (SiO_2)	59.85
Lime (CaO)	4.83
Oxide of iron (Fe_2O_3)	2.17
Oxide of alumina (Al_2O_3)	18.16
Oxide of soda (Na_2O)	8.99
Phosphoric acid (P_2O_5)	Trace
Manganese	Trace
Magnesia (MgO)	0.21
Potassa (K_2O)	Trace

These are probably combined as follows:

Water	3.37
Carbonate of lime	5.36
Silicate of lime	3.79
Silicate of magnesia	0.52
Silicate of alumina	42.79
Silicate of soda	17.52
Silicate of iron	4.61
Free silicate or sand	14.98
Total	99.94

Would be pleased to hear whether it is of value on account of this property. Yours truly,

THE NEW ENGLAND BROWNSTONE CO.,
W. F. RANNEY, Supt.

Cromwell, Conn.

We are not prepared to say what actual present value the several valuable properties indicated in the above analysis is to the owners of the property. Aluminum has become so plentiful in recent years that the supply has far outstripped the demand for it. We note, however, that a scientific gentleman has accomplished machine flight. If aerial navigation is an accomplished fact, there will doubtless be such a demand for aluminum that the supply will be wofully inadequate. Aluminum is the strongest, lightest metal that has come into practical use for machine construction in recent years. It would seem to be just the thing for air-ships. Our correspondent may have something that will, finally, stand "kiting"—on the stock exchange.

FLAT SLATE ROOFS.

BUILDERS and roofers generally regard slate as adapted only for roofs having a high degree of pitch, and that sheet metal is the proper material for all classes of roofs of low pitch, or entirely flat. This opinion is based on the past experience in roofing, says a writer in an English contemporary, but has no foundation in fact. A flat roof may be constructed of slate, having all the advantages of any other slate roof. The slate, instead of being split into thin slabs and cut in various sizes of ordinary roofing slate, is sawed into large blocks of any convenient size, with square corners and straight edges, and split into slabs varying in thickness from one-half inch to two inches, according to the strength of roof required. The edges of these slabs are carefully smoothed and jointed, so as to fit closely, and placed side by side so as to form a plain, smooth surface, instead of lopping. The joints or edges are laid in cement, which unites the pieces and renders them water tight. The slabs are kept in position by their own weight, or may be fastened to their supports by galvanized iron or copper bolts or screws. A roof of this construction requires no painting and very little repairing. It has a decided advantage over sheet metal, in that expansion and contraction from heat and cold are practically inappreciable in slate. By using iron trusses or beams as supports, a perfectly fire-proof roof may be constructed in this manner, a want long felt but never fully realized in the erection of fire-proof buildings.—*Carpentry and Building.*

OUR FOREIGN TRADE IN STONES, ETC.

From the summary statement of the finance, commerce and immigration of the United States, corrected to March 31, 1897, we compile the following:

ARTICLES.	FEBRUARY.				8 MONTHS ENDING FEBRUARY—			
	1896		1897		1896		1897	
Imports—	Quan.	Values.	Quan.	Values.	Quan.	Values.	Quan.	Values.
Cement, Rom., Portland imp. from (lbs.)		*Dollars*		*Dollars*		*Dollars*		*Dollars.*
United Kingdom	21 484,356	71,021	3,802,892	12,389	246,660,244	778,088	147,722,551	479,407
Belgium	8,129,881	21,700	3,216,781	8,678	182,509,043	544,140	169,141,954	494,512
France	194,551	605	176,400	540	12,577,542	34,816	8,903,961	24,172
Germany	11,423,081	35,586	7,236,764	22,436	344,078,501	1,145,241	283,849,622	935,701
Other Europe	634,934	3,360	.....	.....	38,115,818	141,954	7,714,645	28,825
British North America	.....	.....	.....	.....	2,606,761	12,389	2,102,300	8,368
Other countries	.....	.....	411	1	.....	.....	804,511	3,872
Total	41,866,803	132,272	14,433,274	43,994	826,637,969	2,656,659	620,209,544	1,974,397
Marble, and mfrs. of	.....	37,872	.....	73,847	.....	572,990	.....	458,774
Stone, & manufactures of, including slate	.....	27,643	.....	13,483	.....	273,462	.....	224,349
Total	.....	65,515	.....	87,330	.....	846,452	.....	683,123
Exports—								
Marble and stone, and manufactures of:								
Unmanufactured	.....	4,588	.....	2,669	.....	51,181	.....	43,078
Manufactures of—								
Roofing slate	.....	20,111	.....	66,140	.....	113,638	.....	431,402
All other	.....	44,025	.....	31,489	.....	451,173	.....	367,530
Total	.....	68,724	.....	100,298	.....	615 992	.....	842,010
Cement..... bbls	.....	.....	2,664	5,562	.....	.....	20,888	38,977
Exports foreign mdse.								
Cement, Rom., Portland & other hydraulic...lbs	647,527	2,019	360,977	1,647	3,527,635	13,168	2,338,049	8,537
Marble, & mfrs. of	.....	.....	.....	153	.....	1,342	.....	3,703
Stone, & mfrs. of including slate	.....	1 50?	.....	.....	.....	6,078	.....	6,821
Total	647,527	3,521	360.977	1,800	3,527,635	7.420	2,338,049	19,061

Merchandise Remaining in Warehouse on February 29, 1896 and February 28, 1897, Respectively.

ARTICLES.	February 29—			
	1895.		1896.	
	Quantities.	Values.	Quantities.	Values.
Cement, Roman, Portland, etc.....lbs...	10,998,095	$ 30,880	10,403,600	$ 29,560
Marble and stone, and manufactures of:				
Marble, and manufactures of	.....	76,720	.....	37,015
Stone, and manufactures of, including slate	.....	.....	.....	1,291
Total	10,998.095	107,600	10,403,600	67,866

Stone Trade with Foreign Countries during the Years ending June 30, 1892–1896.

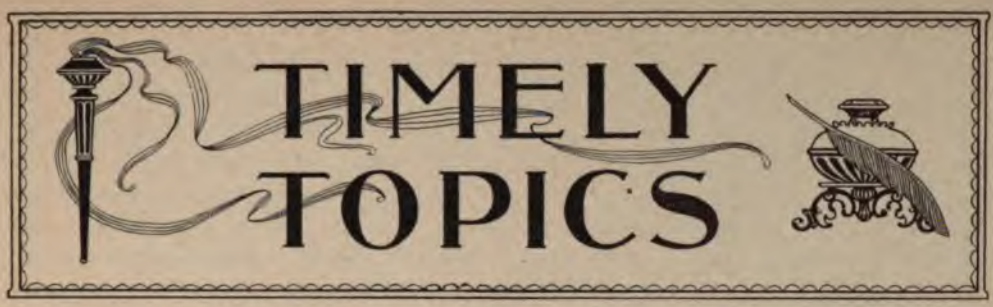
MARBLE AND STONE AND MFRS. OF.	VALUES.				
	1892	1893	1894	1895	1896
Imports—					
Balt more, Md	78,200	1 0,409	92,653	96,781	100,269
New Haven, Conn	10,487	14,041	10,330	4,045	5,034
New York, N. Y	780,200	1,048,315	669,097	702,116	787,180
Passamaquoddy, Me	9,0 3	2,864	4,654	2,788	2,040
Puget Sound, Wash	1 831	1,214	928	4.190	8
Exports—					
Belfast, Me	1,7 0	.....	.....	.....	.....
Buffalo Creek, N Y	.....	14,23o	14,710	9,998	13.633
Champlain, N. Y	33 964	24,777	21,754	11,354	13,377
Cuyahoga, O	4,547	2,910	.....	65	269
Detroit, Mich	36,942	16,886	29,724	20.130	31,166
Huron, Mich	10,720	12.1.2	10,141	10,216	12,178
Oswegatchie, N. Y	4.255	4 915	4,565	12,365	10,435
Vermont	27,557	39,197	53,418	39 010	47,231
Imports from—					
Belgium	72,128	102,578	40,858	22,560	19,047
Italy	587.23	704,603	623,821	637,574	684,886
United Kingdom	404,483	567,237	4 9,643	327,230	366,167
Nova Scotia, New Brunswick, Etc	50.814	45,979	22,681	22.1 6	27,353
Mexico	64,848	186,313	10,195	99,898	121,286
Exports to—					
Cuba	31.708	77,003	103. 75	83,022	15,531
British Australasia	7 ,526	67,595	24,152	28.644	61,685

Imported Merchandise remaining in warehouse on June 30, 1892–1896.

MARBLE AND STONE AND MFRS. OF.	VALUES.				
	1892	1893	1894	1895	1896
Boston and Charleston, Mass.	28,873	16,005	19,806	20,912	27,604

Imports for Consumption, 1892–1896.

ARTICLES.	Years.	Rates of duty.	Quan.	Values.	Duties.	Ad valorem rate of duty.	Value per unit of quantity.
MARBLE AND STONE AND MFRS. OF:							
Marble, in blocks, rough or squared, of all kinds		*Per cu. ft.*	*Cubic feet.*	*Dollars.*	*Dollars.*	*Per cent.*	*Dollars.*
	1892	65 cents	376,489.27	522,610.00	244,718.04	46.83	1.39
	1893	do	457,600.33	758,749.60	297,440.15	39.20	1.66
	1894	do	316,138.77	448,764 19	205,486.96	45 80	1.42
	1895	do	50,809.3-	81,196 00	33,026.08	40.68	1.60
		50 cents	358,589.42	557,145.00	179,294.84	32.18	1.55
	1896	do	368,207 02	627,736.00	184,103.52	29.33	1.70
Veined marble, sawed, dressed, or otherwise, including marble slabs and paving tiles							
	1892	$1.10	64,062.89	126,876.00	70,469.24	55 54	1 98
	1893	do	110 303.72	199,064.87	121,229.65	6 .9	1 81
	1894	do	85,343 36	175,211.11	93,377.67	53.58	2.05
	1895	do	8,074.03	16,415.20	8,881.42	54.11	2.03
		85 cents.	84,288.04	145,664.2	71,644. 4	49.18	1.73
	1896	do	146 86 .1	239,206.78	124,838 01	52..9	1.69
All manufactures of, not specially provided for	1892	50 per cent	.....	223,407 40	111,703.71	50	.....
	1893	do	.....	177,361..6	88,680.88	50	.....
	1894	do	.....	87,.24 50	43,662.25	50	.....
	1895	do	.....	4,020 73	2,010.37	50	.....
		45 per cent.	.....	57,529.9-	25,888 50	45	.....
	1896	do	.....	65,816.81	29,617.56	45	.....
Stone—							
Ballast	1892	10 per cent.	.....	6,345.00	634.50	10	.....
	1893	do	.....	3,892.00	389.20	10	.....
	1894	do	.....	2,776 00	277.60	10	.....
	1895	do	.....	5,287 00	528.70	10	.....
	1896	do	.....	3,302.00	333.20	10	.....
Breccia, in blocks or slabs	1892	Free	.....	583.00	.....	.....	.....
	1893	do	.....	975 00	.....	.....	.....
Freestone, granite, sandstone, limestone, and other building or monumental stones, except marble, not specially provided for—							
Hewn, dressed, or polished	1892	40 per cent.	.....	355,250.50	142,100.32	40	.....
	1893	do	.....	459,147.96	176,659.18	40	.....
	1894	do	.....	369,039.94	147,615.97	40	.....
	1895	do	.....	29,437.3-	11,774.96	40	.....
		30 per cent.	.....	262,945.04	78,883.51	30	.....
	1896	do	.....	320,432.99	96,129 89	30	.....
Unmanufactured or undressed	1892	11c. cu. ft.	172,397.63	52,882 18	18,983.76	35.86	.31
	1893	do	147,416.11	47 131.00	16,215.77	34.41	.32
	1894	do	133,888.33	39,694.26	14,727.74	37.10	.30
	1895	do	30,393.50	9,3.8.00	3,343 29	35.84	31
		7c. cu. ft.	67,531.81	23,126.00	4,727.23	20.44	.34
	1896	do	65,182.33	21,3 3 0(	4,562 77	21.38	.33
Limestone	1892	10 per cent.	.....	54 00	5.40	10	.....
	1893	do	.....	.69.0	16.90	10	.....
	1894	do	.....	6.00	.60	10	.....
Slates, roofing	1892	25 per cent.	.....	1,615.00	403 75	25	.....
	1893	do	.....	1,878 00	469.50	25	.....
	1894	do	.....	2,198.00	549.51	25	.....
	1895	20 per cent	.....	4,418.00	883.60	20	.....
	1896	do	.....	224 00	44.80	20	.....



The Senate Tariff Bill. Sandstone, limestone and other building stone, except granite, does not require a 50 per cent. ad valorem, or a 14 cents per cubic foot, tariff to give American producers ample protection, but it is just as well that they should have that much if any at all is granted. Those building stones will never bring a price that will warrant their importation, and the imposition of a tariff tax will not affect the rated value of the American product. They are to be now had in abundance at too cheap a price to warrant any foreign producer in competing, tariff or no tariff. What the building stone industries of this country need more than everything else to stimulate the use of stone in building is protection, if you please, against the discrimination of carrying companies, and against the periodic assaults of organized labor.

But the Senate tariff bill is an improvement over the House bill so far as granite and marble is concerned. We believe the rate against the importation of those products should be practically prohibitive. It is not likely another country on the globe, free trade or protection, whatever its governmental policy might be, would permit industries like our granite and marble quarries and mills, to suffer disadvantages such as beset these trades from foreign competition. It would not be a hardship to a single true blue American citizen, if not another foot of either material ever came to our shores. There is abundance of both products beneath the free soil of our blessed land rivaling anything found in Europe.

Durability of Stone. The durability of building stones is indicated by their chemical composition, both in the crystalline and the non-crystalline, or sedimentary groups. And the nature of both the grains and cementing material is to be considered. The latter may be such as to be readily acted upon by atmospheric elements, and the stone fall to pieces as a heap of quartzose sand, each grain of which, by itself, would have resisted for ages. Without the bond the tottering wall gives away. The principal atmospheric agents which attack stone are carbonic, hydrochloric, nitric, and sulphuric acids, ammonia and several organic acids. These agents, carried by rainwater, act by solution, oxidation, deoxidation and hydration and the constituent minerals as well as the cement are affected by them. And the durability of any given stone is determined by that chemical constitution which is least liable to change under their action.

The Strength of Stone. In estimating the strength of a stone to resist pressure it is not safe to predicate an opinion upon examples of cracking or breaking in the walls of a building, whether before or after its completion, for a little inequality in the

bedding may produce such a result, when, if evenly bedded, the stone would have borne many times the load it has sustained. In a large and heavy building it is all important that the foundations be firm and unyielding, for on this depends the integrity of the entire structure. Beyond this it is important that the stone be evenly cut, so that the bed of each succeeding block should rest upon those below it. From an inequality in dressing two adjacent blocks of stone to the same thickness, leaving at their junction one of them slightly projecting beyond the other, the superincumbent block of granite is sometimes cracked quite through. This breaking was not due to pressure alone, nor to want of strength in material, as was evident from the perfection of the wall below, but entirely to the pressure bearing upon the center of a block resting on an uneven bed, or supported at the two ends and not in the center.

Variation in Stone. Every stone dealer and quarryman knows that while there are innumerable quantities of stone, that really good quarries are as scarce as good gold or silver mines. Most quarries contain some good stone, but they are few that can furnish good stone in any amount. Oölitic stone may be classed as coarse and fine—rotten or tough. Coarse stone is often very strong, and fine-grained stone may be very weak. It is rare, however, that a quarry can furnish either uniform coarse stone or uniform fine stone. Lack of uniformity causes great loss in stone-cutting and labor. It is cheaper to pay double for a uniform stone than half for one that causes great loss of time to stone-cutters worth $4 per day. Stone will vary in color, and uniformity in this, considered with relative grain, hardness and toughness, is rare in large quantities. All these questions enter the problem, and it is these variations that the irresponsible stone broker seizes upon to sell the stone of worthless quarries to innocent customers. These evils are general and they demand persistent and energetic engagement by the owners of first-class stone. The purchaser needs to be educated—we mean especially the architect and contractor—they need to be taught that all that is called marble, or granite, or sandstone, or oölitic, or stratified limestone, does not mean statuary or building stone.

"Hobson's Choice." Whatever may be the art interests of the buyer of a monument, his selection is usually defined by the specimen books, and it is useless to add that the types therein shown are monotonous and commonplace to the last degree. A half hour in any modern cemetery will reveal the dearth in ideality, and complete monotony of treatment. The manufacturers of monuments, or the most of them, pay little attention to the art side of their work. Very few of them employ an artist, and there is a general indifference to educational influences. It would seem as if preference were given to the lowest class of trade, and no attempt made either to raise the standard of taste, or to cater to the higher culture of the nation. The trade has grown purely mechanical, and "monuments" are rather the creation of the lathe and planer than creations of an artistic brain seeking to impress the higher sentiments. It would seem that if more general attention were given by the monument houses to creative work, that it would richly repay them, and in time revolutionize the meretricious taste that is satisfied with mere blocks of stone, dreary in their monotony and absolutely serving no purpose than to mark the spot

where a relict lies buried. Cost, of course, interferes with a popular use of the higher forms, but this condition would not be so general if opportunity for a better art were given by those into whose hands this trade has fallen. And we predict that if more attention were given to art in monumental design that it would result in rich returns.

The Outlook for Building. Indications are multiplying for a very busy and prosperous season in the building trades. Financial prosperity is assured and the backwardness of building during the past three years will be overcome in this. There is nothing in the way apparent as among the possibilities, excepting a war between the operatives and employers. On this there are many unsettled questions, some of which should be allowed to stay unsettled through mutual default.

The need of uniformity in prices, in wages and in methods is the need of the trade, and for that matter, of all trades. These prices should be fair, and admit of prosperity to all its parts. Should they be uniform, but unfair, the prospective buyer will suspend operations. But the present condition is unfair to the trade, and by reaction, to all parts of the trade, because of lack of uniformity in wages, in material and methods. Jointly they lead to unfairness in competition. Unfairness in competition leads to a general lowering of the prices of stone and other materials, and to a lowering of wages. The tendency is downward, and will continue to be downward until it is changed, not into expansion, but into stability, and stability cannot exist with any one of these elements unconsidered.

The trades unions have interposed the only effectual obstacle to this general tendency downward. The resistance they have met has made them fretful, distrustful, and a prey to panic. Some of the employers seem to direct their force more for the destruction of the *status* of their workmen than for the elevation of their own. Such efforts, in the long run, are doomed to certain failure. Temporary victories may be had, but their legacy will be unquiet, nervousness, and an isolation of sentiment and interest. In short, such will regard their employer as their first enemy, and that they do in many instances so regard him is the seed of prior efforts to destroy his only means of preservation of his individual interests, and yet these interests are identical and should be merged, or if this immergence be not immediately practicable, a general appreciation of its necessity and a striving to attain it would go far to restore the confidence that is the first thing essential.

The Supervising Architect. The passing of William Martin Aiken may leave no "aiken void" in Uncle Sam's architect's office, but he is, by no measure, however, the least distinguished architect who has imperiled a good reputation in that wofully entangled place and failed to satisfy "the powers that be." He has done better than some of his predecessors, and probably as well as any architect of first-rate ability can do under the restrictions that encompass that place. The position of government architect is one that no man of real power in his profession can afford to take, while it is under the influence and domination of politics. Divorced from that menacing rule, and it would be one of the best and most honorable public offices in the nation's service, worthy the ambition of architects of highest renown. Given over to management of an architect conspicuous for the work I

has achieved in the designing and erection of public buildings, and who would supervise much and design little, and we would have no more eyesores among Federal buildings. We earnestly hope Mr. Aiken's successor will be an architect who, while he is superior as an artist, may be permitted to engage his powers as a judge rather than as a designer. Give architects a chance to contribute to the nation's glory, and to weave a crown of laurel for themselves.

Channeler and Drill. One reason why the channeling machine as a labor-saving device figures higher in proportion than a rock drill is because the channeler is always at work while the drill works intermittently. Those who have spent much time about quarries have noticed that the noise of the channeler is constant throughout the day; while the rock drill is only heard at intervals. After the track has been laid for a channeler, say for a distance of fifty feet, the machine begins cutting, and when its channel has been cut one foot deep, for the distance, it has done fifty square feet of channeling, about onehalf a day's work. Now, there are several machines made that will cut one foot deep without change of any kind. It is rare, of course, that the stone will admit of so much cutting with a single gang of bits; but where it does machines may work for half a day without stopping. With the rock drill the case is different. As each hole is put into a depth of two feet, the machine must be wound up and a new and longer steel inserted until a still further depth of two feet is drilled; thus, the machine is constantly receiving attention on the part of the runner; and moreover, the holes are completed frequently so that the machine must be moved and started at another hole. All this goes to show how important it is to have a machine so designed that it may be kept at work constantly. If some form of bit could be applied to a channeler that would hold its gauge and keep a sharp edge for a considerable length of time, it would be a valuable addition to a channeling machine. As it is, the chief delay arises from the frequent change of bits made necessary in most kinds of stone by wear and tear in the cut.

The Aesthetic Sense. There are an hundred texts for sermons on stone in the article in this number of STONE by John Cotter Pelton, the eminent architect of New York City. Mr. Pelton eloquently expresses what we believe every noted architect would frankly concede, that too much sentiment and feeling are sacrificed to the mammon of expediency In the selection of modern building materials, and to that influence, as expressed in the machine-made material, "may be traced with unfailing certainty the general decay of the artistic sentiment, the lack of individual responsibility."

Can true artist be named who has ever contemplated a reproduction in terra cotta or concrete of an artistically designed façade or capital, and will not frankly confess his disappointment that it had not been wrought in stone by a master hand. The machine cannot put sentiment and reverence into its graven work any more than the Aleutian Islanders can put symmetry and serenity in the visages of their wooden idols.

SELECTED MISCELLANY.

THE HIGHLY-PRIZED THESSALIAN MARBLE DISCOVERED.

THE quarries from which the ancients obtained the highly-prized Thessalian, or verd antico marble, have been discovered, and are again being worked by an English company. The quarries, which have been lost for more than 1,000 years, are in the neighborhood of Larissa, in Thessaly, Greece. The ancient workings are very extensive, there being no fewer than ten quarries, each producing a somewhat different description of marble, proving without a doubt that every variety of this marble found in the ruined palaces and churches of Rome and Constantinople, and, likewise, in all the mosques and museums of the world, came originally from these quarries. In fact, the very quarry from which the famous monoliths of St. Sophia, Constantinople, were obtained can be identified with absolute certainty by the matrices from which they were extracted.

In modern times verd antico marble has only been obtainable by the destruction of some ancient work, and it has, naturally, commanded extraordinarily high prices. As a consequence, a number of ordinary modern greens of Greek, French, Italian and American origin have been described and sold as verd antique marble. No one, however, who is really acquainted with the distinctive character of the genuine material could be deceived by these inferior marbles. Thessalian green is easily distinguished from any other green marble by the following characteristics: It is a "breccia" of angular fragments of light and dark green, with pure statuary white, the whole being cemented together with a brighter green, while the snow-white patches usually have their edges tinted off with a delicate fibrous green, radiating to the center of the white. The cementing material is also of the same fibrous structure.

RAILWAY LAW DECISION.

IN Massachusetts an employe of a railroad, riding on its train as a passenger, is not a free passenger, though his ticket is such as the company issues only to its employes working in Boston and living at some other place on its line.

In New York a railroad which permits the construction of an inclined track from a stone quarry down to and partly on the railroad line, is liable for the negligence of the quarryman operating cars on such inclined track, by which a passenger on the road is injured, and the fact that the negligent act which caused the injury was performed on the land of the quarryman is immaterial.

In Illinois it is held that a common carrier is not liable for a loss of baggage occasioned by an unforeseen or unprecedented flood, though the flood would not have been encountered but for the carrier's delay.

In Illinois negligence cannot be imputed to a passenger on a street car because he assumes, while riding, an attitude to which the construction of the car invites or tempts him.

In Virginia it is not negligence per se for a passenger on a rapidly moving train to attempt to pass out of one car into another in search of a seat.

In Illinois one who loses a train on which he has secured passage because of the statement of the agent that it was an hour late, whereas it was only forty-five minutes behind time, is

held to have no cause of action against the company.

In Washington, in an action by a passenger against the railroad for injuries received by being thrown from the train in attempting to alight, by the sudden starting of the train, it appeared that the train stopped before reaching the depot platform, and that plaintiff then attempted to get off, when the train was suddenly started, whereby plaintiff was thrown to the ground. There was evidence that the train usually stopped at that place for passengers to get off, and that it was customary for them to get off when the train first stopped, and that plaintiff had ridden upon the train several times before. The supreme court rules that she was not, as a matter of law, guilty of contributory negligence.

EASTERN MANUFACTURERS WANT GYPSUM KEPT ON FREE LIST.

THE efforts now being made at Washington to induce the Senate to impose a duty upon plaster rock, or gypsum, which, in the House, was left on the free list, are exciting much opposition from calcined plaster manufacturers on the Atlantic seaboard, who use the Canadian rock for raw material. The agitation for a duty comes from owners of Western quarries, who submitted arguments to the ways and means committee of the House in favor of a duty. A counter-memorial was forwarded to the finance committee of the Senate by a number of Eastern manufacturers. The protest takes up the arguments of the Western producers in detail. In reply to the claim that the admission of the rock free of duty curtails the employment of labor in this country, as at least four-fifths of the labor involved in the production of plaster is in quarrying it and preparing it for the mill, the memorial of the Eastern manufacturers states that "it is doubtful if one-fifth of the cost of producing plaster can be charged to quarrying." The memorial also sets forth that while Western plaster mills are, as a rule, located at the quarries and consequently not obliged to pay for carriage of the raw matertal, the Eastern mills using the Canadian rock "are subjected to very heavy charges for transportation, most of which is paid out in the form of labor to American seamen and vessel owners engaged in the coastwise trade." The imposition of a duty, it is argued, would enable the railroad companies and Western quarrymen to make larger profits, but would correspondingly depress the American coastwise trade, while at the same time increasing the cost to the consumer for the benefit of railroads and mine owners.

In the memorial submitted by the Western producers it was held that "it would be impossible to form any monopoly of the business. A few thousand dollars is sufficient to equip and erect a plant. There is no more danger of a combination on this product than there is of a combination of flouring mills, and if the price should be advanced to a figure beyond that which would warrant a legitimate profit to the manufacturer numerous mills would immediately spring into existence." In reply to this the memorial of the Eastern manufacturers sets forth that the Michigan producers "organized themselves as regards the sales of their product into an association to control the price artificially," and that in a report of one of the large commercial agencies it is stated that the Michigan and Ohio Plaster Company is "not a corporation but a combination," that the "combine is managed by a representative from each concern interested," and that "the object of the company is to market the product of all the mills interested and divide the profits among them."

"Gypsum rock," continues the memorial of the Eastern manufacturers, "constitutes the raw material used as a basis for a very important industry, which has been built up under conditions of free importation and which conditions it would be ruinously unjust to change. When it is considered that gypsum rock used for land plaster purposes sells for from 50 to 75 cents per ton on board at the Canadian quarries, and calcining rock sells for from 80 cents to $1.25 per ton on board at the same quarries, the injustice of placing a duty upon it becomes at once apparent. The land plaster industry would be ruined to the great disadvantage of the owners of the mills and the thousand or more workmen employed in them. By the destruction of the one interest and a radical curtailment of the other the already greatly depressed coastwise trade of the United States would be most seriously injured.

"It is to be noted that the great proportions to which the plaster business has attained in

the West, according to the estimates of the petitioners in favor of a duty on the rock, have been attained under the existing conditions of free importation of Canadian rock and the fact is patent that they have already, by their creditable enterprise, secured to themselves not only the market for land plaster and ordinary grades of calcined plaster throughout the West, which, a comparatively few years since, were supplied by Eastern manufacturers, but they are also selling their calcined plaster in Eastern markets even as far as the seaboard, where plaster not of the highest quality is required.

"To ask for a duty on the raw material of their Eastern rivals under these circumstances is manifestly unfair.

"First. — They already have protection against the Eastern plaster manufacturers by the amount of the freight between Nova Scotia and the American ports (amounting to from $1.30 to $1.50 per ton) and the freight on the manufactured article from the sea-board to the Western cities, which, taken at the lowest rate prevailing during the season of open navigation when Chicago, Milwaukee, Duluth, etc., can be reached by water routes, is not less than $2 per ton to Chicago, and has averaged for a number of years past even higher than that. Therefore, the Western manufacturer has already a virtual protection in ocean and inland freights amounting to at least $3.30 per ton. When shipped by rail this protection is increased by $2 per ton additional freight, making $5.30 per ton during the season of closed navigation, which covers about five months of the year.

"There is an absolute loss in weight in the process of calcining plaster rock amounting to at least 25 per cent of the total weight, which fact affords an excess of protection to the Western plaster manufacturers against injury by their Eastern rivals.

"A duty on a pure article for the purpose of enhancing the value of an inferior substitute article and forcing its use upon that large class of consumers in the East that are reached by deep water navigation is not propection, but amounts to tariff between States."

FAIRY STONES IN VIRGINIA.

DOWN in Patrick county, Virginia, there is found a peculiar stone much sought after by superstitious people, who believe that the possessor of one of these queer stones is perpetually endowed with good luck. The stones vary in size, and many of them are in the shape of a cross. This is, perhaps, the cause of a legend that is related about them. It is told that the fairies were sent all over the world to carry the news of the birth of Christ. After the glad tidings had been spread the elfs fashioned the stones into crosses, as mementoes of their services. An enterprising jeweler has taken advantage of the superstition and the legend, and is doing a thriving business in the fairy stones, as they are called.

SARCASM AND STATUES.

ONE bronze statue, nine feet high, its feet planted firmly on a granite block, and a thumb thrust into its vest, will soon represent Cornelius Vanderbilt on the campus of Vanderbilt University at Nashville. It will be a more imposing work by far than the statue of John Harvard that sits at the end of Memorial Hall at Harvard, in harmony with the greater grandeur of the subject. John made scholars, but Cornelius made dollars,

And it reminds us that we haven't enough of this sort of thing. Statues have been erected right and left to men who were utter failures in business; men who never did anything worthy of note except to write poems, or songs, or stories, or unintelligible dissertations on such unpractical subjects as a future world, or who stayed in good political places which other men wanted and never made a cent but their salaries, but our rich men have been neglected. The Goulds and Pullmans and Sages and Vanderbilts, men who had the genius of thrift and who managed to get some sort of tax rigged on everything that came their way and then collected it, these men are overlooked. If they want a nice tomb they have to build it them-

selves, or they can't be sure their heirs will attend to it properly, and they can't trust the job to an ungenerous public that never appreciated them in life.

What we need is an awakening of the public conscience on this point. We want more statues of rich men. We want our parks filled and our boulevards lined with them. We want Rockefellers, and Rothschilds, and Coal Oil Johnnies, and Huntingtons, and Stanfords on every side. Temples to wealth, that's the idea. Give the people the benefit of associating with the aristocracy, if it is only an aristocracy in stone. It can't help but teach them that the real thing to be striven for is not what some irresponsible persons have led them to believe, but wealth. There's nothing like a rich man, unless it be the statue of a rich man. If you can't have it in bronze, have it in brass.—*Chicago Journal.*

SIMPLE TESTS FOR LUBRICATING OILS.

A GOOD test for oil is to place single drops of different oils in a line upon a piece of plate glass about two feet to two feet six inches long, one end being raised about six inches to eight inches, to form an inclined plane. This test should be conducted in a room where there is little or no dust. The drops of oil start from the top of the inclined plane upon a race with each other. The first day sperm oil will be found in the rear, but after a time it will overtake the others, and be found in motion even after some others have dried up. An oil having a light body runs quickly and dries quickly, but an oil that has both a body and a free flow will readily be detected by this test. An oil may have a good body and yet tend to gum badly, which quality will also be easily detected upon the glass. A good test for the presence of acids, says the *American Electrician*, is to put small quantities oil in copper dishes, which are easily made by depressing bits of sheet copper with a round-faced hammer. If acid is present it will attack the copper and produce verdigris. As a result of experiments carefully made and extending over a year, it was found that iron was least affected by seal oil, and most by tallow oil when it is not de-acidized. Brass is not affected by rape oil, least by seal oil, and most by olive oil. Mineral lubricating oil has no action on zinc and copper, acts least on brass, and most on lead. Lard oil acts least on tin and most on copper. Sperm oil acts least on brass and most on zinc. From the tables given it is found that mineral lubricating oil has, on the whole, the least action on the metals experimented with, and sperm oil the most. For the journals of heavy machinery either rape or sperm oil, in admixture with mineral oil, is the best to use, as they have the least effect on brass and iron, which two metals generally constitute the bearing surfaces of all engines.

BOOKS AND PERIODICALS.

"THE STORY OF ARCHITECTURE: An Outline of the Styles in all Countries," by Charles Thompson Mathews, M. A., Fellow of the American Institute of Architects, etc. D. Appleton & Company, New York. Price $3

Outside of the educational interest that attaches to a new text book of strong scholastic merit, "The Story of Architecture" should be welcomed by the students of "the most useful of all arts," because of the author's fascinating treatment of his subject. The work is written in popular language, is remarkably sparing in the use of technical terms and prosiness of dates and names, considering the profundity of the subject and its breadth of historical scope, and preserves the charm of a romance from beginning to end. From the pyramids, obelisks and temples of Egypt—"the architectural fruit of the glorious despotisms of Cheops, Chephren and Mycerinus long anterior to the Flood"—to American achievements at the "White City," is a tremendous span of time denoting the Professor's comprehensive survey of history. The plan of topical division adopted for the work is excellent, every chapter being complete in that respect, which enables the student to refresh his memory on any given period or phase of development in ancient, mediæval or modern styles of architecture by reference to the proper chapter without recourse to previous or succeeding chapters. The author's style is rich, graphic and lucid—his subject is treated compactly and with practical thoroughness—and the reader's interest is sustained from first to last.

Three catalogues received from the Gates Iron Works, Chicago, present, each in its sphere of departmental specialty, many features of thoroughness of treatment. Catalogue No. 5 is a twenty-page pamphlet, tersely descriptive of the company's improved Crushing Rolls. Perspective views by the photo-engraving process show the Titanic strength and power of these devices in their entirety; while equally faithful sectional drawings reveal their simplicity of detail and the ingenuity of their constituent parts. Catalogue No. 8 is a more copious pamphlet whose forty pages of text and engravings are devoted to the Tremain Steam Stamp Mill; the Harrison boilers, locomotive and portable styles; the Gates Automatic Feeder designed especially for use with the Tremain Mill, together with varied information of value pertaining to all these appliances. Catalogue No. 11 (first edition) relates to smelting—a prolific subject taxing the ability of the compiler to condense into twenty pages all that is written and pictured with engravings on the company's Rectangular Steel Water Jacket Furnace and other varieties; the Bruckner and Howell-White Roasting Furnaces; Cycloidal Blowers, Slag Pots, Sample Grinders, and lastly the Gates Corliss Engines. The company issues over a dozen commercial treatises of the above character on its metallurgical appliances, concentrating, amalgamating, smelting, crushing, elevating, screening, hoisting and pumping machinery, etc. To be had gratuitously on application to any of the Gates Iron Company's offices.

The only flying-machine that has ever actually flown—that is, maintained and moved itself in the air by energy generated in its own mechanism—is one lately constructed, after years of laborious and disappointing experiment, by Prof. S. P. Langley, Secretary of the Smithsonian Institution. The first full and only authoritative account of this epoch-making invention will appear in *McClure's Magazine* for June, in a paper written by Prof. Langley himself, and illustrated with diagrams and pictures made under his direction. This is probably the most important magazine paper ever published in this country.

In the growing preponderance of the scientific work of the government bureaus and the great universities there is danger that the more modest but hardly less important studies of our local societies may be overlooked. To secure proper recognition for their efforts is the object of a series of illustrated papers to be published in *Appleton's Popular Science Monthly*, by Prof. Frederick Starr. The first, in the May number, relates to the Davenport Academy of Science, of whose record in research and the preservation of its fruits any institution might be proud.

The complete novel in the May issue of *Lippincott's* is "Jason Hildreth's Identity." It is a story of unusual originality and power, turning on an incident which has had precedents in real life, the loss of memory and personal identity; but the plot is so deeply and skilfully laid that the last pages will come as a surprise to almost every reader.

RECENT PATENTS.

SECOND SERIES OF PNEUMATIC TOOLS.

Patent No 574,784. issued Jan. 5, 1897, to John G. Carlinet, of Philadelphia, Pa. Application filed May 19, 1893.

Referring to the accompanying drawings, Figure 1 represents a central longitudinal sectional view of the tool, showing the arrangement of the interior portions and also a portion of a chisel or other cutting-tool carried thereby. Fig. 2 represents a cross-sectional view taken along the line 2 2 of Fig. 1. Fig. 3 represents a cross-sectional view taken along the line 3 3 of Fig. 1, and Fig. 4 represents a cross-sectional view taken along the line 4 4 of Fig. 1. Fig. 5 represents a central longitudinal sectional view showing the arrangement of the interior portions after the tool has been acted on by a charge of air or fluid, and Fig. 6 represents a form of handle adapted to be used in connection with the pneumatic tool to stop the operation of the latter at any desired time.

The operator having placed the point or blade of the chisel against the surface to be cut, he holds the chisel with one hand while he presses the pipe H with the other until he feels it come in contact with the anvil. When so held, the parts of the tool may be said to be in their initial positions for action, and the operation of the tool from this point is as follows:

Referring to Fig. 1, which represents the parts in their initial positions, it will be seen that the parts are so arranged that the chamber F is in direct communication with the passage *h*, and the chamber K is open to exhaust through the ports m^2, chamber C, and port *b*. In this position the air or other fluid under pressure enters the chamber F from the central duct *h* through the ports *h'*, *d*, and *d'*. The plunger E, then being the portion which represents the least resistance to the air or other fluid, will be driven quickly forward, striking a sharp blow on the anvil M. The plunger E, after striking the anvil, stops against the same, and the air in chamber F, reacting on the face of the closing-screw D, will force the whole casing backward, compressing the spring N until the parts assume the position shown in Fig. 5. In this position the chamber F is now open to exhaust through the ports *d'*, *d*, d^3, and d^4, and the chamber K is open to the air or other fluid supply from duct *h* through ports h^2, *e*, *e'*, and e^2, while the exhaust to that chamber is closed. When the parts assume the above position, the air or other fluid under pressure entering the chamber K forces the plunger back, and the casing and other parts assume their initial positions. The motive fluid may now be again admitted and the operation repeated. It will be seen that when the plunger E moves forward under pressure of the air or other fluid in the chamber F the port *e* comes in front of the port h^2, but it will be observed that the admission of air or other fluid into the chamber K will not take place until the port e^2 comes in front of the recess *a'* through the backward motion of the casing, as above described.

Instead of exhausting the air or fluid from chamber F through ports *d*, *d'*, d^3, and d^4, a port e^4 may be drilled through the casing, so that when the parts assume the position shown in Fig. 5 the exhaust will take place through e^4 in the same manner as it would through ports h^3, d^3, etc., in supply-pipe H.

The small passage *m'*, communicating with the socket *m* and port m^2, acts to relieve any pressure that might be caused in front of the pipe H through leakage of the socket-joint. In some cases, especially where large tools are used, it is advisable to employ some additional means of arresting the motion of the tool when once started. This is done by the arrangement shown in Fig. 6, which constitutes a sliding handle. When such a handle is employed, the central pipe H is modified, as represented by H'. The duct *h* is partitioned, as at h^9, and two ports h^7 and h^8, drilled through

FIG. 1.

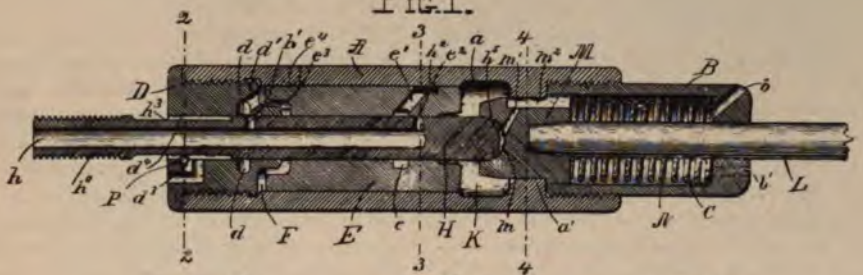


FIG. 2.

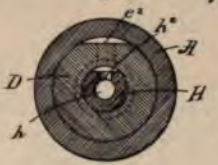


FIG. 3.

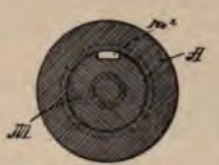


FIG. 4.

FIG. 5.

FIG. 6.

the pipe H, communicate with the central duct, one on each side of the partition h^9.

T represents a piece of hose, and V a hose-coupling screwed to the end of the pipe H. The sliding handle consists of the casing A′, provided at one end with the closing-screw D′. An inner sleeve R is carried within the casing, and the space between the said sleeve and the pipe H, which it surrounds, forms the chamber S.

The packing Q is provided to prevent leakage through the ends. It will be seen that in order for the air or other fluid to reach the tool proper or the duct on the right of the partition h^9, it will have to pass from the duct on the right through the port h^7, chamber S, and port h^8. The above can take place when the sliding handle occupies the position shown in the figure, but suppose the handle to be moved backward, or to the left, then the port h^8 would be closed and the admission of air or other fluid to the tool will be cut off.

When the front face of the casing A′ is in contact with the shoulder h^9, then the positions of the parts will be such as to admit the air or other fluid into the tool, but when the handle is carried to the left, so that the plug D′ strikes the portion v of the hose-coupling, the air or other fluid will be cut off and the tool will stop its operation.

It will be seen from the above that a tool is provided in which a maximum velocity is imparted to the chisel or cutting-tool with a minimum amount of motion of the casing. This insures a heavy blow by the cutting-tool with small vibration of the hand of the operator.

It will be further observed that the parts are extremely simple and that the tool may be easily taken to pieces and cleaned, but it is obvious that although only one form of tool is shown, the same is capable of modification in proportion and minor changes in construction without departing from the spirit of the invention.

Letters Patent No. 575,589, issued Jan. 19, 1897, to Joseph Boyer, of St. Louis, Mo. Application filed Sept. 4, 1896.

This invention relates to machines of the general nature of those heretofore patented by Mr. Boyer, by Letters Patent of the United States No. 277,448, dated May 15, 1883, No. 537,629, dated April 16, 1895, and No. 549,102, dated Nov. 5, 1895.

The first and principal feature of the present invention relates to the valve mechanism by which the movements of the pistons are controlled. It is highly desirable for purposes of convenience in handling the tool when at work that the bodies of tools of this character shall be made as short as can be done consistently with the length of stroke which it is necessary to give the piston in order that the latter may act with sufficient power upon the chisel or other working tool employed with the hammer. Inasmuch as the force of the blows delivered by the piston at any given pressure of motive-fluid depends mainly upon its weight and length of stroke, it is desirable that it shall be heavy and that it shall have as long a stroke as possible; but it is also desirable that the body of the tool shall not be of excessive diameter, and weight must therefore be added to the piston by increasing its length rather than its diameter. Under these conditions, therefore, it follows that increased power in the tool is to be attained chiefly by increasing the length of the piston-chamber to accommodate long strokes of a long piston, and a piston-chamber of maximum length consistent with the length of the tool as a whole is therefore essential to improvement along these lines.

It is the principal object of the novel valve mechanism constituting the first feature of the present invention to accommodate a piston-chamber of increased length without increasing the length as a whole, and to thereby permit a greater length of stroke of the piston in a tool of given length, and consequently increase the power of action of tools of this character. In many other tools of this character which have been patented and some of which are in practical use the valve has been arranged in a separate chamber immediately in rear of the piston chamber, between the latter and the handle or head of the tool, with the result that this interposition of the valve in a separate chamber at the rear end of the piston-chamber and in line with the latter has necessarily diminished the possible length of the piston-chamber by the amount of space occupied by the valve-chamber and valve, and has consequently diminished to that extent the possible length to be given the stroke of the piston in any tool of given length. In the novel valve mechanism of this tool the valve consists of a cylindrical shell arranged within the piston-chamber itself and of a sufficient internal diameter to surround the piston and permit it to pass entirely through the valve. This valve is preferably located in the rear end of the piston-chamber, so that the piston passes through and is surrounded by the valve at the

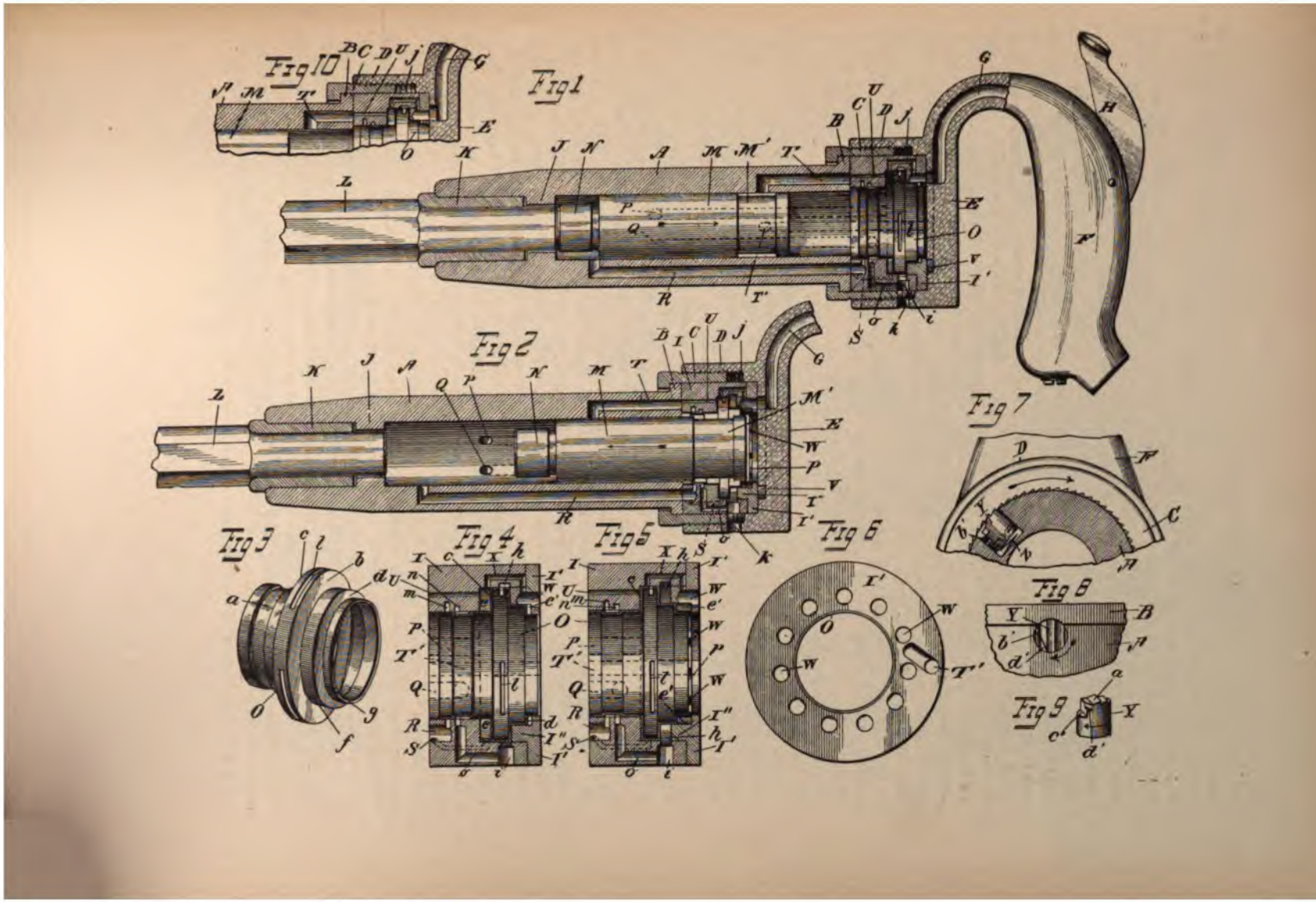


Fig 10
Fig 1
Fig 2
Fig 3
Fig 4
Fig 5
Fig 6
Fig 7
Fig 8
Fig 9

end of its rearward stroke, as illustrated in the drawings; but this particular location of the valve is not essential to the broader scope of the invention. It results from this construction and arrangement of the valve that the space occupied by it does not diminish the length of the piston-chamber at all, since the piston-chamber extends entirely through the valve, and it therefore follows that a tool of given length will accommodate a piston-chamber as much longer than the piston-chambers of the prior tools above referred to as the length of the space occupied by the valve-chamber and valve in such prior tools, thereby permitting greater length of stroke for the piston and correspondingly increasing the force of its blows and the power of action of the tool.

Another feature of this invention consists in a construction whereby the inner end of the shank of the chisel or other working tool itself forms the means for closing the front end of the piston-chamber and constitutes a part of the cylinder head or abutment against which the motive fluid admitted to the front end of the piston-chamber acts in driving the piston rearward.

Another feature of the invention relates to a novel locking device for the coupling-sleeve which holds the parts of the tool together.

Figure 1 is a longitudinal section of the new tool with part of the handle left in elevation and with the piston at the forward end of its stroke and the valve in corresponding position; Fig. 2, a view corresponding to Fig. 1 with the handle of the tool broken off and with the piston near the rear end of its stroke and with the valve in corresponding position; Fig. 3, a perspective view of the valve itself; Fig. 4, a vertical section of the valve-block and valve with the valve in the position shown in Fig. 1; Fig. 5, a corresponding view with the valve in the position shown in Fig. 2; Fig. 6, an elevation of the rear face of the valve-block, (the right-hand face of the block shown in Figs. 4 and 5); Fig. 7, a sectional detail illustrating the locking device heretofore referred to; Figs. 8 and 9, further details of the same, and Fig. 10 a sectional detail of a modification.

For a detailed description of the parts, and the method of operating the tool reference to the complete specifications set out in the patent, is suggested.

Letters Patent No. 574,003, issued Dec. 29, 1896. to Frank C. Rinsche, of St. Louis, Mo., assignor to the Chouteau Manufacturing Company, of same place. Application filed June 22, 1896.

Figure 1 is a longitudinal sectional view through the engine, showing the piston in its forward position. Fig. 2 is a similar view showing the piston in its rear position. Fig. 3 is a sectional view through the handle-base on line 3 3, Fig. 1. Fig. 4 is a sectional view through the handle-base on line 4 4, Fig. 1. Figs. 5 and 6 are rear end views of the cylinder. Figs. 7 and 8 are views similar to Figs. 1 and 2, showing the engine in a different operative position. Fig. 9 is a cross-sectional view through the controlling-valve in the handle on line 9 9, Fig. 1. Fig. 10 is a similar view on line 10 10, Fig. 2.

In an application for a patent for an improvement in engines filed by him in the United States Patent Office on or about April 4, 1896, (serially numbered 586,250) the inventor says he showed and described an engine which, by changing the position of the handle relative to the cylinder and interchanging the inlet and exhaust, would cause the piston to deliver two kinds of blows upon the control of the inlet or exhaust, as the case might be. One of these blows, upon the control of the inlet, was weak, by reason of the reduced pressure, but quite rapid, while the other, upon the control of the exhaust, in which the pressure was not reduced, was strong, but delivered at intervals, that is, the exhaust at the rear end of the piston being choked would prevent a rapid movement of the piston to the rear, but as soon as the ports registered to throw the valve, the forward movement of the piston being unretarded, would be quick and full of strength. The engine forming the subject-matter of this application involves, practically, these same features, there being changes in the construction tending to simplify the engine and reduce its cost of manufacture.

Reference to the full specifications is necessary to an intelligent understanding of its construction and operation.

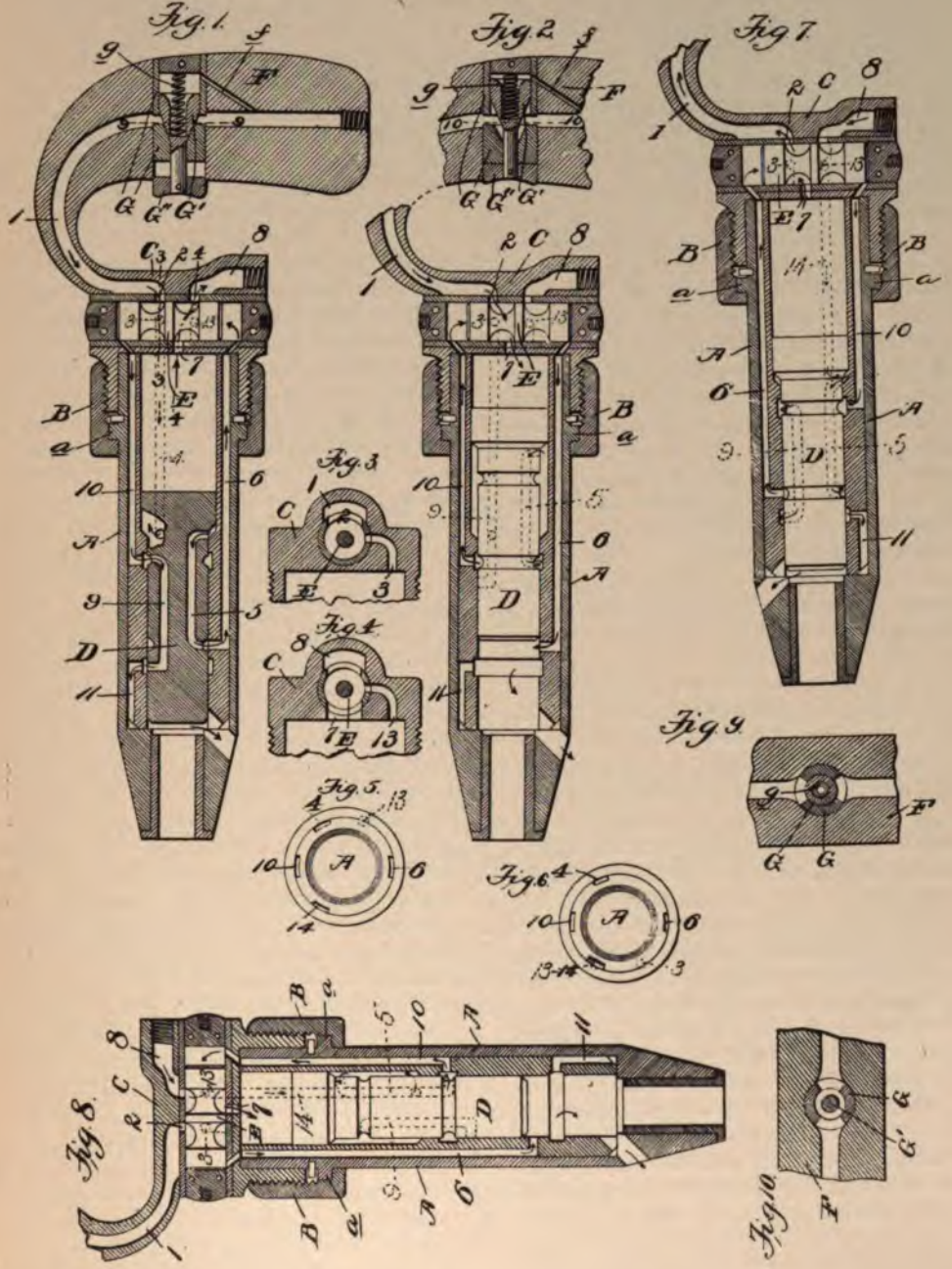


Fig. 1.
Fig. 2.
Fig. 7.
Fig. 3
Fig. 4
Fig. 5.
Fig. 6.
Fig. 9
Fig. 8.
Fig. 10.

MACHINERY AND SUPPLIES.

[Matter appearing under this head is compiled and edited from data furnished by the advertiser, and should not be accepted as the opinion of the publishers.]

ELECTRICITY IN BELTS.

Some time since an engineer in a large factory called the attention of a visiting expert electrician to the electricity in a big driving belt, and was quite surprised when the expert informed him that the electricity was caused by the belt slipping. The expert added that it was simply a wasting of power, and could be prevented by applying *Dixon's Traction Belt Dressing*, made by the JOSEPH DIXON CRUCIBLE CO., JERSEY CITY, N. J. This dressing was applied and the electricity disappeared at once. Electricity in belts is not only a waste of power, but it is also an element of danger by fire.

"AMERICAN" HOISTING MACHINERY IN JAPAN.

OUR readers may have observed in the daily papers an item relative to the recent closing of a contract with the Carnegie Steel Company, of Pittsburg, for furnishing all the steel material for a four-story office building 150′x235′, to be immediately erected in Tokio, Japan. This contract is not an exceptionally large one in amount, but is interesting as an indication of the probabilities for future growth in this direction, being the first steel building to be put up in the empire, which will naturally attract much attention in Japan; and, it is believed, will lead to the adoption of this system of building. The possibility of earthquakes precludes the putting up of higher buildings than this one; but there appears to be no reason why the most substantial buildings should not, in the future, be built of steel.

The first building is constructed by, and for, Mitsui & Co., of New York, Yokohama and Tokio, the engineer and architect being Mr. Tamisuke Yokokawa. Mr. Yokokawa has just visited the United States, and closed the contract with the Carnegie Steel Company, and has also made a direct purchase from the American Hoist & Derrick Company, of St. Paul, Minn., of a considerable quantity of hoisting machinery, including hoisting engines, four derricks, etc., constituting the complete equipment necessary to erect this building.

The American Hoist & Derrick Company make this sale through their New York branch office, and it is a noticeable indication of their enterprise in securing such a contract.

WILLIS SHAW, CONTRACTORS' MACHINERY,

506 New York Life Building, Chicago, Ill, has just shipped a car-load of hoisting engines and rock drills to the Southern California Mountain Water Company. He has also secured an order from Venable Bros., of Atlanta, Ga., for an 800-foot span suspension cableway for their granite quarries. Other recent sales reported by him are: Two channeling machines to Flynn & Co., at Philadelphia; 56-ton steam shovel to A. J. Twiggs, at Augusta, Ga.; crushing machinery to the Dessau Company, at Iron Mountain, Mich., and hoisting and quarrying machinery to Watkins & Hardway, Tallahassee, Ala.; Williams & Schmidt, Granville, N. Y.; Mathews & Keith, Manitowoc, Wis.; Consolidated Stone Company, Chicago, Ill., and G. R. Root, Buckingham county, Va.

THE TEMPERLEY TRANSPORTER.

An exhaustive and interesting description of the Temperley Transporter appeared in the *Scientific American* of April 24, the apparatus being shown in detail and in its application aboard of the U. S. Battleship Massachusetts, in coaling that vessel at sea. The view presented in connection with the latter is very true to life, and the simplicity of the Transporter and method of operation is evident at a glance. Most of the foreign governments have already adopted this very practical and ingenious

means for coaling at sea, and it was the admirable results obtained in this particular service that led the United States Government to purchase the Transporter for its navy.

We would recommend our readers to investigate the workings of this newest of hoisting and conveying devices.

The sole right to manufacture the Temperley Transporter in this country has been secured by the Lidgerwood Manufacturing Company, 96 Liberty street, New York City.

The Lidgerwood Manufacturing Company, New York City, recently received an order from their London representatives for three Lidgerwood hoisting engines and boilers of the latest improved type. This makes twenty machines sold by the London branch since the first of the year, and points to a good business in the Lidgerwood engines abroad in due course of time.

REMARKABLE STONE SAWING.

To the Editor of STONE:

SIR:—I have recently been engaged in making some tests of the Rapid Stone Saw, which will interest your readers.

The company owning the patents of this saw have recently been sending out some literature calling attention particularly to tests made by the Franklin Institute. The results promised being truly phenomenal, many practical stone dealers found it difficult to accept the statements as true. A further demonstration being demanded, I was called upon to make two tests in the presence of members of two of the largest granite producing concerns in the country. Accordingly, a block of North Carolina granite from the Mt. Airy quarries was placed under a ripper saw, the blade of which is sixteen feet long. During the first test, I, with ordinary conditions, cut 14½ inches depth of kerf per hour, and during the second test I cut 17⅓ inches per hour. The machine is intended to run at the rate of 85 double strokes per minute; these tests were made at a speed not averaging over 75 double strokes. I feel, therefore, that I could have made 20 inches per hour had the full speed been maintained. In an hour's cutting no appreciable wear on the saws could be noticed, although carefully measured.

I understand that both of the parties present at the time tests were made have adopted the new system and are now installing machinery.

Respectfully, WM. COOK, M. E.

PNEUMATIC FALSEHOODS CORRECTED.

INASMUCH as the manufacturers of competing tools, claimed by us to be infringements of our patents, have been trying to make sales of their tools by misleading statements in regard to the decision of the Court of Appeals in our suit against the Boyer tool and our discontinuance of the suit against Thomas Phillips & Son, users of the Wolstencroft and Clement tools, we deem it only fair to the public to make a statement of the facts in these cases.

The decision of the Court of Appeals in the Bigelow case involving the use of the Boyer tool was to the effect that an injunction should not be granted upon affidavits alone, as to a point which had not been settled in the previous litigation, namely, whether the Bates patent covered the indirect control of the piston by the valve, and the Court, so far from deciding this point against us, merely made "a postponement of a definite decision until the respective theories of the parties have been subjected to the test of more stringent investigation than can be made by the aid of affidavits."

The order of the Circuit Court granting the injunction was, therefore, reversed, but *without costs to us*. It is our intention to push this suit to final hearing, when the reserved question will be decided upon formal proofs, and, if we are successful, as we confidently expect to be, the Boyer tool will be held an infringement of our Bates patent, and all users of the same will be liable to us.

The piston in the Wolstencroft tool is indirectly controlled by the valve, but this point did not receive any attention from either side in taking the testimony in the Phillips suit, and the case was ready for hearing when the decision of the Court of Appeals was rendered. In view of the fact that the record as made did not bear on this question and that it could more properly be settled in the Bigelow suit, we discontinued the Phillips suit with the *intention of bringing another action against the Wolstencroft tool*, in which we would be in a position to *adduce evidence having special reference to this point*. If we succeed in such action, as we confidently expect to, all users of the Wolstencroft tool will be liable to us for such use.

The Clement tool does not involve the question of indirect control, but, as Phillips & Son had been users of the Clement tool, a discontinuance of the case necessarily involved a discontinuance of the suit as to the Clement tool

also. The court had enjoined Thomas Phillips & Son from the use of the Clement tool, and it is our intention to proceed against the further use of such tool, by injunction or otherwise, as it may be necessary, it being clearly within the terms of our Bates patent as construed in both decisions of the Court of Appeals in the Fisher and Bigelow suits.

We have just entered suit against Volkening & Co., of New York, for infringements of our patents by the use of the valveless tool (Kellar type).

We claim that the use of any other tool makes the user liable to us for infringement of either the Bates patent, the Bagnasco valveless tool patent, or the McCoy patent on the Art.

This liability is actual, since users of the Pneumatic & Electric Co's tools have paid us damages in large amounts.

Our tools do more work and consume less power than any tools in existence.

We sell or rent at prices which will not warrant the user in assuming any liability for infringement.

THE AMERICAN PNEUMATIC TOOL CO.,
844 Washington street, New York.

THE CHOUTEAU HAMMER.

The following letter is an entirely unsolicited recommendation of the Chouteau Pneumatic Hammer by one of the users of the tool:

CLYDE, O., April 2, 1897.

The U. S. Metallic Packing Company, Philadelphia, Pa.—GENTLEMEN: Mr. —, of Mauch Chunk, Pa., has informed me that he intended to equip his works with two or three pneumatic tools, and I have this day written him that I can cheerfully recommend your tools as being in my estimation the best working tool on the market. I told him that I have tried several other makes, but found that your tools appear to strike a stronger blow and do better and cleaner work.

I think that if you will correspond with the said gentleman that you will secure his order. * * *

Yours, very truly, W. E. HUGHES.

On a recent visit of STONE'S representative to the works of the United States Metallic Packing Company, Philadelphia, he was shown through their Pneumatic Hammer Department, and the working of their tool, its economy in the use of air, its ability to do work, and the smoothness with which it runs, were all pointed out to him in detail.

The Chouteau Hammer, which they now intend placing on the market, is the outcome of twenty years' experience in the line of pneumatic tools. Since the United States Metallic Packing Company took up the manufacture and sale of pneumatic appliances of various kinds (principally hammers for stone work), they have spared neither labor nor expense in perfecting their tools; and now, after over a year's conscientious and painstaking experimenting, they claim to have evolved a tool which for general stone work is the finest pneumatic hammer on the market to-day. Their hammer will do all classes of work from the finest carving of Italian marble and granite to roughing out. This is accomplished in the same tool by means of an adjustable bush in the chisel end of the hammer, by which the length of the piston stroke can be regulated to suit the work and quality of stone.

The United States Metallic Packing Company will be glad to furnish any information possible in reference to their tools, and will send hammers on trial when desired, and if not satisfactory at the end of thirty days they will take them back and pay all charges of transportation. They feel confident, however, that the tools will not be returned after receiving a fair trial. See their ad. in this issue.

JOHN MASLIN & SON,

Engineers and machinists, Jersey City, N. J., have recently issued a new list of second-hand hoisting and stationary engines, boilers, pumps, and miscellaneous machinery, which they will be gratified to send to anybody desiring a complete list of second-hand machinery adapted to quarry use. They also announce a reduction in prices on the Maslin pumps and duplicate parts of same.

The catalogue collections of quarrymen and contractors are not complete that do not contain the Dobbie Foundry and Machine Co.'s new catalogue No. 5. There is in this work a pictorial exhibit of nearly every machine and implement known to the practical operator in quarries and stone yards and in general contracting works, and what is especially commendable is the excellence of the pictures and the tabulation of prices, sizes, etc., referring to them. We suggest to every reader the need of just such a work, and as this may be had for the asking, we advise every one to secure it. Address the company at Niagara Falls, N. Y.

You are interested, of course, in pneumatic tools for stone-cutting and carving, that is, if you are an up-to-date stoneworker. As neat a pamphlet, fully descriptive of this tool, its mode of operation, and its particular points of superiority are set forth in the little book of

description, testimonials and fine pictures, recently issued by the Chicago Pneumatic Tool Co., Monadnock Building, Chicago, makers of the famous Boyer tool, fully described in our Patent Department in this issue of STONE. The pamphlet is published in several sizes, but each size contains essentially the same text and engravings. We suggest that a copy be procured by those interested before the editions are exhausted.

HELP WANTED.

Advertisements under this heading 10 *cents per line each insertion.*

WANTED—Large quarry company of New England wants practical working foremen, capable of stripping, clearing, opening and working marble quarries. Also expert channelers, gadders and drillers. State fully experience, references and pay wanted. Address F. J. ELLSWORTH, Case Building, Cleveland, O.

WANTED—A draughtsman who thoroughly understands all branches of stone-cutting, making patterns, estimating stone quantities from drawings. A practical man who has been in the business preferred. Address F. C., 726 Scranton St., Scranton, Pa.

WANTED—A few good steady men that can cut granite bases, and have bush hammers. Other tools furnished. Long job for right parties. Address GRANITE WORKS, Skrainka, Madison county, Mo.

SITUATIONS WANTED.

Advertisements under this heading inserted for subscribers to STONE *free of charge. Advertiser must send* 25 *cents to pay postage, if replies are to be addressed in care of* STONE *Rate to non-subscribers,* 10 *cents per line each insertion.*

WANTED—Any quarry corporation in need of a thoroughly experienced manager or foreman would find it to their advantage to write to 20 PEARL street, Montpelier, Vt.

WANTED—Advertiser desires position with quarry owner or manufacturer, building or monumental work. Accustomed to management and experienced in plans, estimates, drawing, etc. Address, A. B., care of STONE.

WANTED—Position as manager and salesman, in good city, with a reliable firm, by a thorough granite and marble man, practical and experienced in all branches of the business. Best of references given. Moderate salary accepted for first year. R. H. C., care STONE.

TO QUARRYMEN—I would like a position as manager for some large quarrying firm. Have had twenty years' practical experience in the stone business. Would buy an interest in the business if satisfactory terms could be made. O. HURST, Fort Hunter, N. Y.

WANTED—A situation as superintendent or foreman of cut stone works. Twenty years' experience as a journeyman, foreman, superintendent and contractor; can give first-class reference; strictly sober and systematic. Salary reasonable for a first-class man. Address A. YOUNGBLOOD, 184 Second Ave.

WANTED—Position as foreman stone-cutter, or superintendent, by practical man, who thoroughly understands all branches of stone-cutting. Would invest a few hundred in the business if terms are satisfactory. Best of references given. ERNEST WALKER, 41 Jackson Ave., Long Island City, N. Y.

WANTED—An Eastern granite and marble man, practical and experienced, thoroughly understands every branch of the business, viz., buying, selling and manufacturing both marble and granite, make working drawings, take charge of workmen, and do office work. Competent to take full charge of business or shop. Sober, reliable, of good address. I want position as foreman or manager. Can refer to some of the leading firms in United States. Distance no objection. Correspondence solicited. Address "GRANITE," 1038 Hastings Ave., St. Paul, Minn.

TO SELL. TO BUY. TO EXCHANGE.

Advertisements inserted in this department for 15 *cents per line each insertion.*

FOR SALE—Four stone planing machines, large and extra heavy. Made by Lincoln Iron Works; all in first-class condition; will be sold at a bargain. Address HUGHES BROS. & BANGS, 321 Metropolitan Bldg, New York.

FOR SALE.—One Ingersoll-Sergant Bar Channeler, with bits, in good order, cheap. One new C. Aultman Co. No. 4 Stone Crusher, with elevators. One new C. Aultman Co. 20 H. P. Engine, complete, cheap. Address, THE PLYMOUTH STONE CO., Plymouth, O.

WANTED—A counter sinker or dishing machine for basin slabs. Cheap for cash. State maker and price. MAXWELL & DEMPSEY, Jefferson and Cherry streets, New York City.

FOR SALE—One second-hand Ingersoll channeling machine in first-class order, for sale cheap. Apply to LORD, BOWLER & CO., Cleveland, Ohio.

FOR SALE—Quarries, etc., of the Chicago Brownstone Co. Supply inexhaustible. Membership in Quarrymen's Association with same and corporate franchise if desired—or will lease on royalty. CHICAGO BROWN STONE CO., 716 Reaper Bl'k, Chicago.

FOR SALE—Cheap, a four gang marble mill and quarries, located at Loudon, Tenn. This mill must be sold or leased within the next few months, and the best offer gets the mill. Will sell or lease mill separate from quarries if so desired; or will sell machinery. Address H. N. GREER, Loudon, Tenn.

HOW ABOUT ROCK DRILLS?

I have the following for sale:

5 No. 1, 2¼ in. Rand "Little Giant" Rock Drills.
8 No. E 26, 3¼ in. Sergeant Rock Drills.
40 No. F 2, 3½ in. Ingersoll Rock Drills.
12 No. 4, 3⅝ in. Rand "Little Giant" Rock Drills.

All repaired and in guaranteed condition.
All the same price—$125 each, including Tripod and weights.
Can furnish immediately.
I also have Channelers, Compressors, Hoisting Engines, etc.
You want some of these. Act promptly.

WILLIS SHAW,
Contractors' Machinery,
506 N. Y. Life Bldg., Chicago, Ill.

Edwards, Macdougal & Co., 180 W. Regent St., GLASGOW, SCOTLAND.

STONE MERCHANTS,

Rouge Granite, Seynite, Marble and Sandstone for Building and Monumental purposes. Paving stones. Curbs and Setts for Roadways.
Correspondence Invited.

CONTRACT NEWS.

Racine, Wis.—Ten thousand dollars have been pledged for the erection of a new Catholic church at Kaukauna. The amount desired is $30,000.

Haddon Heights, N. J.—Plans have been prepared by architect Henry Dagit, 706 Walnut street, Philadelphia, Pa., for the erection of a one-story and basement and gallery church at Haddon Heights, for the Roman Catholic Church of that place. To be constructed of stone and iron; have hot water heat; plumbing; tiling; frescoing; electric light fixtures, etc. Cost $25,000.

Dubuque, Iowa.—F. Heer, Sr., has gone to Pomeroy, O., to submit plans for a new church at that place.

Albany, N. Y.—A. W. Fuller has been selected as architect for the Moody Memorial Chapel, which will be erected at Northfield, Mass., at a cost of $30,000.

Pittsburg, Pa.—Plans have been prepared by Architect F. C. Sauer of 335 Fifth ave., for the erection of a 3½ story school for the St. Joseph's Roman Catholic church, Liberty ave. and Pearl st. To be constructed of pressed and ornamental brick, with stone trimmings; have steam heat, plumbing, tiling, electric lighting, etc. In the basement will be bowling alley, billiard room, gymnasium. Third floor will contain assembly hall to seat 700 and balcony 200. Will have opera chairs. Cost $50,000.

Pittsburg, Pa.—The East End Colored Baptists propose to erect a $15,000 church on Carron street near Highland avenue. Subscriptions are being raised for the purpose.

Troy, N. Y.—Plans have been prepared by Architect E. W. Loth for the erection of a new Catholic church at Chatham, this state. To be constructed of brick, with stone trimmings; have marble tiling; plumbing; furnace heat; frescoing; electric light fixtures, etc. Cost about $30,000.

Sault Ste Marie, Mich.—John McKay will give particulars relative to the new church the Methodist congregation contemplate erecting shortly in this city. To be constructed of stone; have pews or opera chairs; pipe organ; plumbing; tiling; plate and cathedral glass, etc. Cost about $15,000.

Albany, N. Y.—Member of Assembly Sheldon, of Cayuga, introduced a bill March 30 appropriating $18,000 for a bridge over the canal at Main street, Port Byron.

Cleveland, O.—The city council committee on harbors and wharfs and public works a few days ago recommended the adoption of a resolution to prepare plans and specifications for a new bridge at Center street, across the Cuyahoga river. The structure is estimated to cost $120,000. Address D. E. Wright, Director of Public Works.

Philadelphia, Pa.—Testimony for and against the constructing of the proposed bridge over the Schuylkill river at Gray's Ferry road was heard March 28 by Major C. W. Raymond, U. S. Engineer for this district. The intention of the Department of Public Works is to build an entirely new bridge above the old one. This is to be about 2,000 feet long, with a thirty foot roadway, and footwalks on each side 12 feet in width, making it 50 feet wide. Director of Public Works Thompson will give particulars.

Newton, N. C.—Dr. J. C. Clapp is interested in the erection of a monument in the Tipps grave yard, three miles east of Newton, in memory of those early settlers who lost their lives at the hands of the Indians.

Washington, D. C.—The Senate Library Committee has made a favorable report on the bill introduced by Senator Cullom of Illinois, appropriating $50,000 for a statue of Lincoln, at Gettysburg, Pa. The committee also reported favorably on the bill introduced by Mr. Cullom, providing for acquiring a site and erecting a

VICTORY FOR THE BOYER HAMMER.

To the Trade:

We are pleased to state that on January 7th the United States Circuit Court of Appeals, at New York, in the infringement suit brought by The American Pneumatic Tool Company against the Bigelow Company, of New Haven, Conn., for using the Boyer Hammer, decided in favor of the defendant, and reversed the decision of the lower court, thus confirming the position we have always taken, and the assurances which we have given the trade, that the Boyer Hammer did not infringe the patents of the American company, and furnishing a complete answer to the threats and misrepresentations which that company have been making with respect to the Boyer Hammers.

In addition to our regular Boyer Hammers, which are familiar to the trade and have acquired such a high reputation, we are now prepared to furnish a still further

improved style of hammer, which we have designated The New Boyer. The valve mechanism of this new hammer is entirely different from the old, and is designed to accommodate an increased length of piston chamber and an increased length of piston stroke, and consequently materially increase the force of the blows of the piston in a tool of given size, without increasing the length of the tool as a whole. It also reduces the vibration of the hammer to practically nothing, so that in both of the above respects the new hammer is superior to the old. We are prepared to furnisn either style. ALL TOOLS SENT ON TEN DAYS' TRIAL, SUBJECT TO APPROVAL, AND GUARANTEED FOR ONE YEAR AGAINST REPAIRS. Our new catalogue is in the hands of the printer, and is now ready for distribution. We desire to have all stone-workers possess a copy of it. Furnished free on request.

CHICAGO PNEUMATIC TOOL CO.,

635 Monadnock Building, Chicago, Ill.

peace monument on the battlefield of Appomattox, Va., and appropriating $50,000 for that purpose.

Washington, D. C.—Mr. Young of Pennsylvania has introduced a bill for the erection of a statue in this city to William D. Kelley, in addition to his former bill for a statue to Samuel J. Randall. Both bills carry an appropriation of $50,000 each.

Des Moines, Ia.—W. W. Carr of Sheldon, Ia., is interested in an opera house to have a stone front. The C. E. Eastman Co., architects, Des Moines, Ia.

Binghamton, N. Y.—Clerk Back will receive bids for the construction of the new court house, according to plans and specifications furnished by Architect I. C. Perry.

Pittsburg, Pa.—Plans have been prepared by Architect S. F. Heckert, of 341 Sixth avenue, for the erection of a casino for Rev. Father Bernard, of Pine street, south side. To contain a hall which will seat 400 people, have stage, scenery, opera chairs, plumbing, etc. Cost about $25,000.

Joliet, Ill.—C. H. Carpenter, secretary of the school board will give particulars relative to the erection of a new school building in this city this season. It will be a very fine structure and will have all the modern conveniences.

Bradford, Pa.—Plans have been prepared by Architect A. E. Curtis, of Fredonia, N. Y., for the erection of a new City Hall at Bradford. To be constructed of brick and stone; have steam heat, marble tiling, plumbing, mantels, plate and ornamental glass, etc. Cost about $30,000.

Philadelphia, Pa.—Plans have been prepared by Architect Emil C. Tritten, of 410 Walnut street, for the erection of a ten-story office building at 12th and Walnut streets, for a syndicate of Philadelphia capitalists. To be built of granite, stone, iron, steel and brick. Cost about $500,000.

Houston, Tex.—The University Club, at its annual meeting the other night, indorsed the plans for its new building, at 54th street, which will cost $2,000,000. It will be a very handsome structure and will have the latest equipments.

South Haven, Mich.—A new $1,000 monument will be erected for the soldiers.

Sault Sta Maria, Mich.—Hancock will erect a $30,0 0 Finnish Seminary building next summer.

Bellaire, Ohio.—The School Board will submit a proposition to issue $15,000 of bonds for new school buildings at the special election April 19.

Philadelphia, Pa.—The Board of Public Education, 715 Filbert street, is receiving bids for a large school to be built at 13th and Porter streets. To be three-story and basement. Constructed of brick and stone. Will cost $70,000.

Baltimore, Md.—Plans have been prepared by Architect Henry Brauns, of the Builder's Exchange building, for the erection of a large three-story and basement school building for the Board of Education. To be constructed of brick, stone and iron. Cost about $50,000.

Grand Rapids, Mich.—Work has begun on a new $15,000 school building at Otsego, and it is hoped to have the structure ready for occupancy at the opening of the fall term of school. The contract for the seating has not yet been awarded.

Sharon, Pa.—Representatives from every Grand Army post in Mercer county were present at a meeting to decide on the erection of a soldiers' monument. It was decided to build a $7,000 monument near the Court House. The contract was awarded to a New Castle firm.

A meeting was held in Washington City to organize a Soldiers' and Sailors' National Monument Association. Its object is "the erection of a monument at the capital of the Nation in honor and memory of the officers and enlisted men of the army and navy of the United States who fell in the war of the rebellion, which shall serve as a prepetual reminder to the present and future generations of the sentiment entertained by all loyal people for the soldiers and sailors who risked their lives in the defense of their country.

The citizens of Dearborn, Mo., are thinking of erecting a monument to the memory of Colonel Harrington, one of the early settlers in the town to whom its success and growth is, in a great measure, due.

The Tennessee students of the Peabody Normal College, located in Nashville, Tenn., have begun a movement to raise funds for the erection of a monument to George Peabody in

The Wolstencroft Pneumatic Tool.

ADAPTED TO CUTTING, CARVING and LETTERING

Granite,
Marble,
Bluestone,
Onyx and
Limestone.

SUCCESSFULLY IN USE AT MANY OF THE LARGEST WORKS IN THE UNITED STATES.

PATENTS HAVE BEEN SUSTAINED BY THE COURT.

We contract for the complete installation of plants, including Air Compressors of most approved types, pipe line and all fittings.

PRICES REASONABLE.
MACHINERY GUARANTEED.

Fair Treatment Shown all Patrons.

Address

4 ANVIL.

3 BUSHING.

2 HAMMER.

1 VALVE.

WOLSTENCROFT PNEUMATIC TOOL CO.,

(Frankford) PHILADELPHIA, PA.

commemoration of his philanthropy to the South. Organization of the Peabody Memorial Association of the State of Tennessee has been perfected. The movement is not confined to students, but is receiving active and hearty support from prominent citizens.

Gettysburg, Pa., is to have an Abraham Lincoln monument. A bill has been introduced in the senate by Senator Cullom of Illinois, appropriating $50,000 for the purposes. The senate library committee has presented a favorable report. Also a favorable report has been made on the bill introduced by the same senator providing for the purchase of a site and erecting a peace monument on the battlefield of Appomattox, Va. These two monuments have been contemplated several years, and now there is a good prospect for their erection. The peace monument is particularly appropriate, and an interesting memorial for both sections.

Easton, Pa.—The Northampton County Grand Jury has approved the petition of citizens for the erection of a soldiers' monument in Easton at the expense of the county.

Cynthiana, Ky.—The Christian Society will build a church. Estimated cost $20,000.

Noblesville, Ind.—The Christian Society has decided to build a new church as a cost of $15,000.

Cassopolis, Mich.—The St. James' Episcopal Society will erect a new church.

Cambridge, O.—The M. E. Society has decided to build a new church. Rev. J. A. Selby, Z. T. Whissel, J. B. Siegfried, building committee.

Butler, Pa.—At a congregational meeting of the members of the English Luthern church it was decided to build a new place of worship as soon as possible, $13,000 having been pledged for what purpose. The congregation intend erecting a handsome stone structure, the cost of which, exclusive of furniture, will not exceed $15,000. To have a seating capacity of 900.

Ingram, Pa.—A handsome new church building is soon to be erected at this place by the Presbyterian Society. To cost about $16,000. Address Rev. James B. Hill, Pastor, or the members of the building committee, T. J. Rex, T. A. Palmer, S. G. Verned.

Milwaukee, Wis.—St. Mary's Catholic church of Kaukauna will erect a $25,000 edifice this year, unless unforseen circumstances prevent.

Wayne, Pa.—Boyd & Boyd of Philadelphia have been chosen to prepare plans for a church to be erected by the Central Baptist Society.

Waukegan, Ill.—The trustees of the Methodist Episcopal church have decided to build a new church edifice and a new parsonage.

Williamsburg, Pa.—Masons have purchased the site of the recently burned Second Presbyterian church and will erect a magnificent temple. The church will build further up town.

New Brighton, Pa.—The directors of the old Brightou bridge between this place and Beaver Falls have decided to submit a proposition to the stockholders. at their annual meeting on April 26, to replace the present old structure with a new, modern one, to cost $60,000 or $70,000.

Watertown, N. Y.—Mayor Wise will give particulars relative to the erection of a new bridge in this city. If a new bridge is built it will be either a stone arch one or a melin arch bridge. It will probably cost between $60,000 to $40,000. City Attorney Pitcher may also be addressed.

Centerville, Iowa.—The Appanoose county citizens have petitioned the board of supervisors to call a special election to vote on a proposition to issne $75,000 in bonds for the erection of a court house.

Wabash, Ind.—The Wabash county commissioners decided to erect a memorial hall instead of a soldiers' monument in compliance with the unanimous request of the soldiers. $25,000 will be expended in the building. There is now in the county treasury $17,000 available for the building.

Cynthiana, Ky.—At a meeting March 24, at the Christian church, it was decided to build a new church. The building will cost about $20,000, a large part of which has already been subscribed.

New Orleans, La.—An association has been organized by James L. Bradford, and others, to erect a monument to Louisiana's great ornithologist, John James Audubon.

UNITED STATES METALLIC PACKING CO.

PHILADELPHIA, PA.

Manufacturers of Adjustable Stroke Pneumatic Stone-Cutting Tools.

SAVES AIR, TIME AND MONEY.

"CHOUTEAU" HAMMER.

Pneumatic Drills. Pneumatic Sander.
Pneumatic Bell Ringer.

METALLIC PACKING FOR ALL KINDS OF SERVICE.

CHICAGO OFFICE,
1003 Marquette Bldg.

OFFICE and WORKS,
427 North 13th Street.

HOISTS AND DERRICKS

OF STRICTLY THE BEST DESIGN.

STEAM,
ELECTRIC,
BELT,
HORSE AND
HAND
POWER
HOISTS.

CATALOGUE.

STEEL OR
TIMBER,
GUY,
STIFF-LEG,
TUBULAR,
CRANE AND
TRAVELLING
DERRICKS.

AMERICAN HOIST & DERRICK CO.

ST. PAUL, MINNESOTA.

CHICAGO, 60 So. Canal St. NEW YORK, Havemeyer Bldg. NEW ORLEANS, Hennen Bldg.

SECOND-HAND PLANERS

Especially Adapted for Stone.

60 in. Pond Planer, planes 25 ft. long, heavy.
44 in. Wood & Light Planer, planes 10 ft. long, heavy
38 in. Pond Planer, planes 10 ft. long, medium.
37 in. New York Steam Engine Co. Planer, planes 12 ft. long, heavy.
36 in Pond Planer, planes 16 ft. long, heavy.
30 in. Pond Planer, planes 7 ft. long, medium.
30 in. Pond Planer, planes 8 ft long, heavy.
28 in. Putnam Planer, planes 8 ft. long, heavy.
24 in. Flather Planer, planes 6 ft. long, heavy.
24 in. New Haven Planer, planes 6 ft. long, medium.
24 in Putnam Planer, planes 7 ft long, medium.
25 in. Huebner(Screw) Planer, planes 5 ft. long, medium.

We also have a lot of SECOND-HAND LATHES, suitable for turning pillars, posts, etc., both stone and marble 6 to 40 inches diameter, and any length.

Kindly write us and we will give you valuable information.

Prentiss Tool and Supply Co.

115 Liberty St., NEW YORK.

Chicago Store, 62 and 64 South Canal Street.

SPIRAL

Sand Pump

For Feeding Sand, Steel or Shot for

SAWING STONE.

Of all Kinds. Does More Sawing, Uses Less Sand and Water, Requires Less Power and Repairs than any other. Runs only 20 revolutions per minute Pays for itself in Six Months.

FRENIER & LeBLANC, Rutland, Vt.

Hawley's Patent Sand Feed

Is used by all the leading firms—saws faster and better than any other sand-feed. More gangs using our feed than any other. Easily kept in order. Also many gangs working satisfactorily, using crushed steel. Can give best of references.

Orders solicited.

E. J. & C. H. HAWLEY,
Manchester, Vt.

Gasoline Engines....

For pumping water from quarries this is the best, most reliable and cheapest engine.

Catalogue free.

The VAN DUZEN GASOLINE ENGINE CO., Cincinnati, O.

Stone and Marble Cutters' Mallets

J. B. HELLENBERG,
Coldwater, Mich.

Our mallets are giving splendid satisfaction on all kinds of Stone and Marble. Strictly first-class second growth hickory Write us. for prices, etc.

WILLIAMSPORT WIRE ROPE CO.

MANUFACTURERS OF

Iron, Steel and Galvanized

WIRE ROPE

HOISTING AND HAULAGE ROPES

A SPECIALTY.

WILLIAMSPORT, PA.

Correspondence Solicited.

THE MORAN FLEXIBLE JOINT

For Rock Drill Connections.

EFFICIENT, RELIABLE, DURABLE.

MORAN FLEXIBLE STEAM JOINT CO., Inc'd.,

No. 149 Third St., LOUISVILLE, KY.

5$ "BONUS" $5

Per Ton will be given to every user, or Merchant, of

CHILLED SHOT OR CRUSHED STEEL

Supplied by

ANDERSON BROS., BOSTON, MASS.

Since May 1, 1896, AND UNTIL FURTHER NOTICE.

This "bonus," is offered and will be paid by

THE MAKER OF THE MATERIALS,

As an inducement for the large number of firms who now use or merchant them to continue to do so, and as an encouragement to others to do likewise. The bonus will be paid on *small or large* quantities (at the rate of $5 per ton) in exchange for Messrs. Anderson Bros.' "delivery notes" or Invoices, which will be returned.

The Chilled Shot has been largely in constant use during the last three years in Lancashire, Yorkshire, Aberdeen (Scotland), the United States, Germany and other countries.

It will not crush or flatten in use, and it is impossible to produce a better material. The very highest quality of the celebrated "B. S." Cleveland (England) Hematitte is used in its manufacture, and it is produced **AUTOMATICALLY** *and in enormous quantities*, on the very latest and most improved system.

SINCE DISCOVERING THE COMBINATION *of metals* by which this exceptionally hard and *tough* shot is produced, the demand has more than doubled, and has necessitated increasing the plant and machinery considerably

As a proof of its high quality, **ORDERS FOR 250 TONS** have been received *during the last three months*, from Aberdeen, Lancashire, Yorkshire, and other parts of England and Scotland. Also the **UNITED STATES** and **GERMANY**, for use in the latter country instead of **CRUSHED STEEL**. It is harder, *stronger*, and consequently more durable and economical than any other; also perfectly clean and free from shells, strings, slag, dirt and rust.

IMPORTANT.

Ordinary chilled shot, containing 10 to 30 per cent. of these impurities is from $2 to $5 per ton *dearer*, as there are only 1,500 to 2,000 pounds of *effective* material in each ton, instead of 2,240, or 200 to 700 pounds short weight.

The chilled steel now offered being free from all impurities and more regular and even in size is worth $2 to $5 per ton *more*, as the users get *full weight of effective* material, notwithstanding which it is now offered **AT A LESS PRICE THAN ANY OTHER.**

In consequence of the **SUPERIOR** quality of this shot and the low price at which it can now be offered, it is much **BETTER THAN CRUSHED STEEL**, not only with regard to efficiency and economy, but also because it **DOES NOT WEAR THE BLADES AS FAST OR SCRATCH AS MUCH.**

ARRANGEMENTS HAVE NOW BEEN MADE

to supply customers **direct from Burnley.** Therefore, in future, please send your orders *direct*, so as to save time and reducecost of forwarding, etc. The shot can be dispatched promptly, *any size*. By sending your orders direct you do not only obtain the **bonus** of $5 per ton, but **also a further reduction in price,** so the shot will be delivered at New York or Boston at $65 per ton, or at the nearest railroad depot to you at $70 per ton, carriage freight, duty, and all other charges **paid,** less 2½, 5, 7½, or 10 per cent. for an order for 10, 20, 50, or 100 tons, respectively, to be sent in quantities, *as desired*, this year. Accounts are rendered in June and December only.

NOTE.—Messrs. Anderson Bros.' "delivery notes" or Invoices should be sent (as a bona fide, and to prevent fraud by non-customers); also all orders, to

JAMES T. PEARSON,

Engineer and Iron Founder, BURNLEY, LANCASHIRE, ENGLAND.

And the amount of "bonus" due will be forwarded direct, *immedia*
and the delivery notes and accounts returned.

Please Mention STONE when you write to advertisers.

NOTES FROM QUARRY AND SHOP.

Ten million dollars' worth of Georgia marble is now being used in the construction of three famous buildings—the State Capitol of Rhode Island, Cathedral of St. John and St. Luke's Hospital, New York. The supply is inexhaustible, and in a few years the marble quarries of Georgia will be the biggest money producing industries in the state.

Bethlehem, Pa.—The Keystone Slate Company, of Chapman's Quarries, has successfully blasted the largest solid piece of slate known to the slate industry. The block, which was moved at least six inches from its original bed, measured 67 feet in length, 14 feet deep, and 13½ feet in width, and contained 12,665 cubic feet. It weighed 2,127,364 pounds, or nearly 1,064 tons. It will produce 1,637 squares of roofing slate and will require one 75 horsepower engine six weeks to hoist it from the quarry.

A. M. Fuller, a merchant of Meadville, Pa., has offered to give $700 to every township in the county which within two years will begin the construction of crushed stone roadways, eight feet wide, costing from $800 to $1,000 per mile. That the existing roads of Pennsylvania depress the price of real estate, injure business of all kinds, make rural life an imprisonment for those months of the year during which society is most needed and cause the young people to detest the farm without their knowing the real cause of the dislike, is doubtless appreciated by Mr. Fuller, if it does not seem to be appreciated by the legislature.

There has been recently discovered in Virginia, not far from Washington, a deposit of hard steatite hitherto unknown in that section of the country. It is found in a mine of soapstone that has been worked for some time past. The product of this new quarry is remarkable on account of its extreme hardness. Some samples have been turned on a lathe and manufactured into balusters and other shapes. It is of such a fine texture that a thread can be cut without disintegration of the stone. The mine owner has made from it a number of mortuary urns. This stone is of a darker color than usual and admits of a rough polish.

Recent German experiments are said to show that bacteria flourish exceedingly in certain building stones, and that even in those not very porous the ubiquitous microbe finds a domicile, and it is recommended that only non-porous stones be used in the construction of hospitals, but as even granites absorb water such stone will be difficult to find.

A discovery has been made in Linn county, Iowa, that will be of great interest to geologists and which may be of untold benefit to the surrounding country. This is nothing more nor less than the discovery of a deposit of marble, known to cover at least five acres. The depth of the quarry has not been ascertained and the location is not given. The marble is of a peculiar brown in color when finished and takes a deep polish.

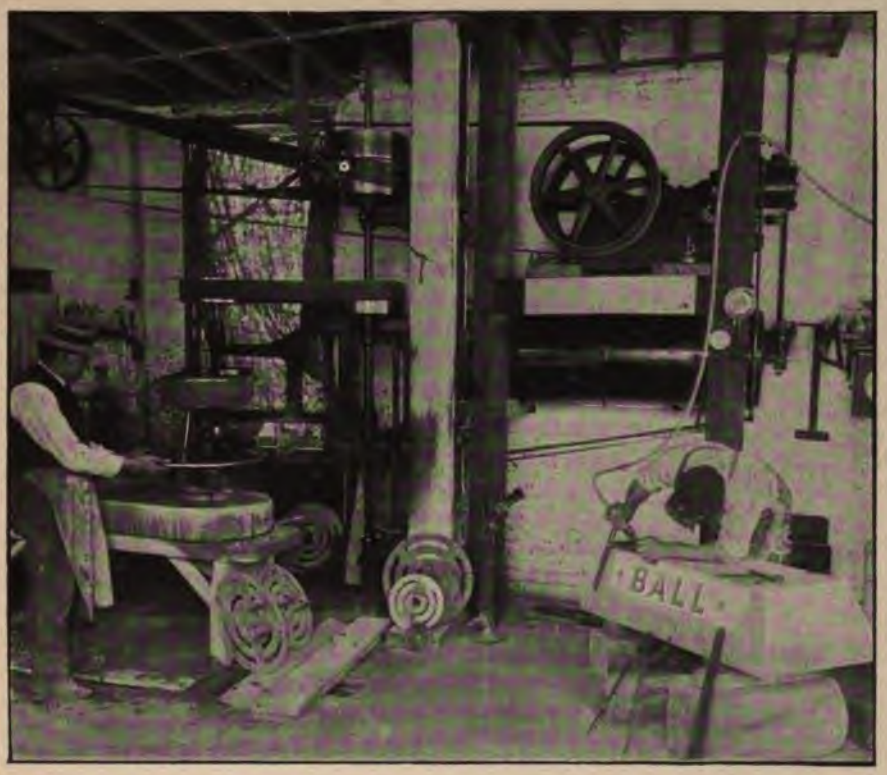
If Mr. Fogarty continues with the development of his Santa Fe quarry, near Joliet, Ill., he will have a little world of industries in itself. The quarry has developed excellent material in building stone and overhanging a portion of the quarry Mr. Fogarty has found a splendid quality of tile clay similar to the clay across the river at Millsdale. Lately, however, he has found something better than anything so far developed—an extensive bed of cement rock. First comes a gravel bed and then the tile clay, then the building stone and next the cement rock. There are two layers of the cement rock and the veins are both heavy. Either of them is nearly double the thickness of the Utica beds.

Boston, Mass.—A bill has been introduced into the legislature to prevent the bringing into this state of any stone cut outside of it, and the debate on it brought out the fact that the master builders and union stone-cutters of this city

Air Compressors

and

Pneumatic Tools in the Stone-Worker's Shop Produce This Result:



VIEW OF INGERSOLL-SERGEANT COMPRESSOR RUNNING CARVING TOOLS.

USED IN QUARRIES BY

Allegheny Quarries, LANCASTER, OHIO
Michigan Stone & Supply Co., SCOFIELD, MICH.
Booth & Flinn, BLAIRSVILLE, PA.
Casparis Stone Co., etc., KENNETH, IND.

STONE WORKERS

L. L. Manning & Son, PLAINFIELD, N. J.
Bowker, Torrey & Co., BOSTON, MASS.
J. S. Rowe, BEDFORD, IND.
Many Others.

COMPLETE PLANTS FURNISHED.

The INGERSOLL-SERGEANT DRILL CO.

OLD COLONY BUILDING,
CHICAGO.

HAVEMEYER BUILDING,
NEW YORK.

201 CONGRESS STREET,
BOSTON, MASS.

26 SOUTH WATER STREET,
CLEVELAND, O.

ROCK DRILLS. CHANNELERS FOR QUARRYING.

are agitating strongly against the bringing in of stone cut by convicts, which, they assert, is being done to not a small extent, to the detriment of business. An amendment was therefore tacked to the bill to prevent the bringing in of stone cut by convicts, but this, it was asserted, was more important than the scope of the original bill, and it was thrown out. It is stated by the stone-cutters that there is no doubt but that stone is being brought into this city which has been cut in the prison yards of the West, and the case which is cited is that of the stone used on the Brazer building, which, it is asserted, is out of the yards of the prison at Joliet, Ill. It is said that this stone comes certainly from farther west than Rotterdam Junction, to which point it has been traced, and the presumption is that it comes from somewhere near Chicago. At the building the foreman says that the stone is Bedford, but that he does not know where it is cut. It is said that E. R. Brainerd, of Chicago, who has the stone-cutting contract, has a good deal of his work done at Joliet, and also that a good deal of cut stone has been shipped from that institution to Boston lately, although it cannot be traced direct from there to the building.

Toledo, Ohio.—Wernert & Burr, stone, succeeded by J. W. Burr.

Montpelier, Vt.—Chas. H. Moore & Co., granite manufacturers, have resumed operations at their granite works, after being closed down since September.

Bethlehem, Pa.—The Keystone Slate Company of Chapman's quarries has successfully blasted the largest solid piece of slate known to slate industry. The block, which was moved at least six inches from its original bed, measured 67 feet in length, 14 feet deep and 13½ feet in width and contained 12,663 cubic feet. It weighed 2,127,364 pounds, nearly 1,064 tons.

It will produce 1,637 squares of roofing slate and will require one 75-horse power engine six weeks to hoist it from the quarry.

A committee representing the New England Granite Manufacturers' association held a conference to discuss the strike at Beattie's quarries at Lette's Island, where 100 granite cutters are out. The committee found that the rule of the agreement between the manufacturers and the union had been violated by Beattie's quarrymen, because they should have submitted the difficulty to a committee of arbitration before voting to strike. Acting on the advice of the committee, the men will return to work and will submit the matter to arbitration according to the agreement. Failing to obtain their desires in that way, they will strike again.

New York, N. Y.—The Bohemian Marble Workers' Union reports having rejected a proposition from the Whitestone Association of Marble Polishers to disband and then have the members join the Whitestone Association for $50 each.

The strike among Italian quarrymen at Rocky Hill, near New Brunswick, N. J., has ceased, and the leaders have returned to work.

The Chicago Journeymen Stonecutters' Association will hereafter take control of the setting of all cut stone that comes out of the various yards in the city of Chicago, and where bricklayers refuse to back up the stone with brick "members of this organization are hereby authorized to do the work themselves." Several years ago, the stone-cutters claim, they not only trimmed the stone used in the erection of buildings, but also did the setting. Then the Bricklayers' and Stonemasons' union took up the question and made a law that members of that organization should do all the setting.

Gouverneur, N. Y.—The Gouverneur Marble Company has started up its quarry and mill on full time. The mill has been running night and day of late, but the quarry proper has been shut down for two and a-half months. A good season is expected and both the mill and the quarry will be run full time. Thirty men are employed.

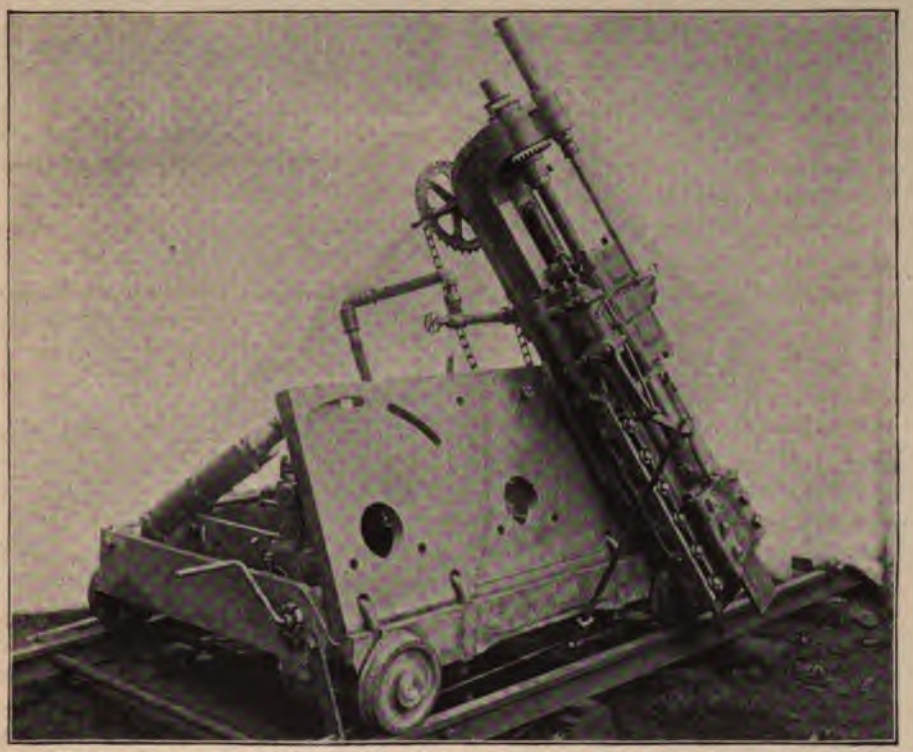
Middletown, Conn.—The Consolidated Quarry Company are selling many of their tenement houses at the lower end of the town, to the present occupants, on easy terms of payment. For many years the quarry company has had control of the houses occupied by their workmen.

National City, Cal.—The large derrick purchased by the N. C. & O. Railway to load rock in the Sweetwater quarry has been put in place. The mast is something over 83 feet in height and the swinging boom attached thereto 75 feet in length. A large double cylinder and double friction drum engine of 35 horse-power

SULLIVAN

CHANNELING MACHINES.

Built in seven different styles to meet all possible quarry requirements.



SULLIVAN SWIVEL HEAD CHANNELER FOR VERTICAL OR ANGLE CUTTING.

55	Sullivan	Channelers	in use on	Chicago Drainage Canal.
80	"	"	"	in Vermont Marble Quarries.
27	"	"	"	in Southern Marble Quarries.
20	"	"	"	in Sandstone and Limestone Quarries.
15	"	"	"	in New York Marble Quarries.

Rock Drills. Quarry Bars. Gadders.

CONTRACTORS FOR PROSPECTING QUARRY LANDS WITH CORE DRILLS.

Sullivan Machinery Co.,

Main Office, 54 to 60 N. Clinton St., CHICAGO. Eastern Office & Works, CLAREMONT, N. H.

Please mention STONE when you write to advertisers.

has been ordered from Chicago. Beside the large derrick, there is a smaller one to load rock. About ten cars of rock are now handled every day with the engine in the quarry. When the large one is on the ground it is expected that the output will be increased from twenty-five to forty cars per day. Each car has a capacity of twenty tons.

Clinton, N. Y.—Efforts are being made to close up the affairs of the Empire Park Granite and Marble Company. L. M. Martin, attorney for the local stockholders, made an application to Judge Scripture for the dissolution of the corporation, and for the appointment of a temporary receiver. Judge Scripture has appointed L. D. Edwards of Waterville referee, and Robert O. Owen of Clinton, receiver. Referee Edwards will hear evidence in the case May 30.

Westerly, R. I.—The Rhode Island Granite Works have been at work on a contract for Norcross Bros., for stone to be used in the New York Life Insurance Company's building in New York City. The city of Providence has placed an order for 200,000 paving blocks with the Rhode Island Granite Works of this town.

Alliance, O.—The Pittsburg, Ft. Wayne & Chicago railroad will hereafter use the limestone output from the workhouse stone quarry. Workhouse Superintendent Pontius has entered into an agreement with the railroad officials for the sale of the limestone. Mr. Pontius agreed to furnish the company with 200 carloads of limestone.

Portland, Me.—The Monson-Burmah Slate Company is now giving employment to seventy-five men at Monson and at Portland, and enlarging its crew as fast as the size of the quarry will admit. It is purchasing the entire plant output of the West Monson quarry.

Edge Hill, Pa.—Charles M. Seltzer, of Philadelphia; Richard S. Neal, of Montgomery county, Pennsylvania; and James J. Dale, of Trenton, have incorporated the Edge Hill Mica-Schist Company. The objects of the incorporators are to quarry, mine, prepare, buy and sell stone and sand. The company is capitalized for $20,000.

Navarre, O.—The Navarre Glass, Marble and Specialty Company was incorporated by Emile Converse, Robert Hug, I. B. Pocock, Phil Loew, William Wanamaker, David A. Fisher, Michael J. Murphy, J. H. Leighton, J. W. Zinsmaster and George H. Hess, for the purpose of manufacturing and selling glass and marble specialties. The capital is $20,000.

The American Red Slate Company, of Middle Granville, N. Y., has been incorporated. The capital stock is $7,500.

Sacramento, Cal.—Colusa Stone Company; principal place of business, San Francisco; trustees—R. W. Gorrill, F. M. Butler and John Ballard, Oakland. F. A. Koetitz, C. F. McCarthy, Alameda; capital stock, $200,000; subscribed stock, $1,000.

Santa Ana, Cal.—H. L. Talbott has leased ground at the corner of Main and Sixth streets and has already commenced the erection of a marble shop there.

Lemont, Ill.—Ankrew Stanger is now operating a good stone quarry near here.

New Milford, N. Y.—At least one new stone quarry will be opened here this spring. M. Shields, Jr., of Nicholson, and J. N. Nelson having leased the Patrick Hand quarry, which was opened a few years ago and abandoned.

Green Bay, Wis.—Fifty men have been put at work in the Northwestern stone quarries at Duck Creek, and five carloads of stone are now being shipped daily to Chicago.

Bangor, Mich.—E. C. Millen has established new marble works.

Nashville, Tenn.—J. H. Leighton & Co., of Akron, O., will establish a glass-marble factory in the Tennessee Centennial Exposition grounds.

Avoca, Pa.—Contractors Warren and Monahan have been awarded the contract of furnishing stone for the two bridges to be erected on the branch of the Wilkesbarre & Eastern Railroad. They will open a quarry in that section of Pittston township known as the Free Orchard.

Eureka, Ill.—The Board of Supervisors of Woodford county has let the contract for the erection of the new court house to the James Devault Construction Company, of Columbus, O., on their bid of $58,100. The new building is to be of buff Bedford limestone, surmounted by a spacious dome rising 105 feet from the base line. Work will be begun at once as the contract calls for its completion by April 1, 1898.

Lamar, Mo.—Joseph Ellis, marble, reported to have given real estate mortgage for $400.

THE WARDWELL
Steam Stone Channeling AND Quarrying Machine

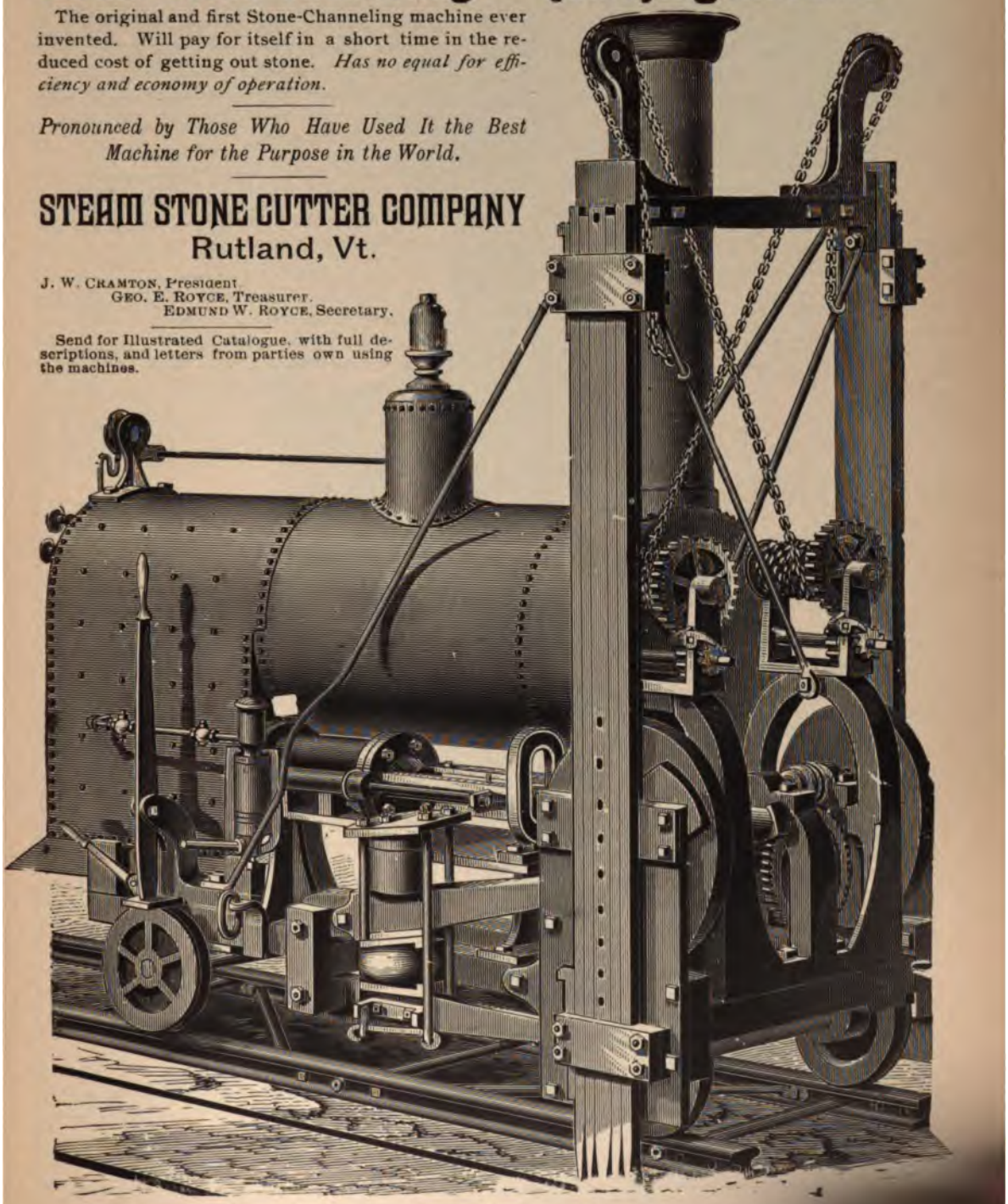
The original and first Stone-Channeling machine ever invented. Will pay for itself in a short time in the reduced cost of getting out stone. *Has no equal for efficiency and economy of operation.*

Pronounced by Those Who Have Used It the Best Machine for the Purpose in the World.

STEAM STONE CUTTER COMPANY
Rutland, Vt.

J. W. CRAMTON, President.
GEO. E. ROYCE, Treasurer.
EDMUND W. ROYCE, Secretary.

Send for Illustrated Catalogue, with full descriptions, and letters from parties own using the machines.



Media, Pa.—Cluster of frame buildings at quarries of McManus & Riley, at Glen Mills, with stone crushing machinery and two flat cars burned. Loss, $6,000; partially insured.

West Chester, Pa.—A destructive fire occurred at Glen Mills, doing damage to the extent of $5,000. Riley & McManus' large stone-crushing plant is located there, and during the evening it was discovered to be on fire. The large engine-house and other buildings about the plant were destroyed. It is thought the two large stone crushers are injured.

Theodore Cowhig, aged 42, died of pneumonia, at his home in Lenox, Mass. Mr. Cowhig conducted a quarry and stone crusher.

Preston, Md.—The Preston Stone Company has been incorporated, in connection with the Preston Lumber and Coal Company, the largest manufacturing corporation in Garrett county, Maryland.

Aaron H. Gould, Somerville, Mass., is at work on the plans for a new $50,000 hotel of brick and stone, which will be erected this season at South Framingham.

The Mt. Airy Granite Company, Greensboro, N. C., is at work on a big order for several hundred carloads of crushed granite, to be used in building the coast defense fortifications now in course of construction at Southport. About one hundred and fifty men are employed at the quarries and it may be necessary to work a night shift in order to get out the granite as fast as the contractor at Southport would like The company is also making large shipments of dressed stone to Cincinnati and other points north.

The stone-cutters' union, of Montreal, has just succeeded in gaining a lawsuit of long standing. Jacques Perrault, a non-unionist, whom the men in one of the shops struck against, has sued the union for $2,500, and carried the case through the lower aad higher courts, and it was finally decided by the latter that the men had a perfect right to work with those they choose, and if one objectionable to them came to work there was no law in the country that could compel them to work with him when they did not want to. The judge said: "The union is a legal institution, and they have a perfect right to manage their own business in their own way, so long as they use no violence to carry out their laws."

The Leesville (O.) Stone Company opened up the season of 1897 under the most suspicious circumstances. All kinds of work was begun in full blast with a force of sixty men, and the quarry will be lively day and night for quite awhile. The company now has orders on its books which will keep it jumping for the next three months, a fact which promises well for the year. It is the best spring the company has ever experienced.

Kaatsdan, N. Y.—Some stone-cutters who quit work at the quarries because only $2.50 was being paid per yard for cutting, have gone to work again for $3 per yard.

A large number of men are at work in the stone quarries near Pontoosuc, Ill., cleaning them out preparatory to opening for the season's work. They are making preparations to work a larger force of men than last year as they expect a great deal more contract work this season than last. They already have several large contracts for early completion that will necessitate the working of an increased force.

By the opening of the stone quarries in Rockcastle county, Kentucky, 1,000 men have been given employment.

Vernon, N. Y.—The Pochuck granite quarries have been started up again.

Detroit, Mich.—Stone-cutters' union will endeavor to secure a promise from the contractor that none but union labor will be employed on the new county building.

Overfield & Gregory have resumed operations at the Degnan quarry in Auburn, Pa. They have enough stone, which is of excellent quality, stripped to keep them employed the entire season.

Westerly, R. I.—Rhode Island Granite Works ask for one hundred granite-cutters at once. This is the first call made necessary by the contract taken to furnish stone for the Washington Life Insurance Company's building in New York. More men will be needed later, a fact which will make it unnecessary for any cutter to remain idle this summer.

Altoona, Pa.—A fatal explosion of dynamite at the quarries of the Pittsburg Limestone Company, situated at Franklin Forge, resulted in the death of Charles Carburry and the serious injury of John Leonard, Adam Kelly and James

Double and Single Head Stone Planers a Specialty.

Gang Saws.

Rubbing Beds, Etc.

F. R. PATCH MFG. CO.

Send for Catalogue B.
Mention STONE.

RUTLAND, VERMONT, U. S. A.

Please mention STONE when you write to advertisers

Collins. An employe who carelessly struck a match to light his pipe tossed it into a can of dynamite and the explosion followed instantly.

Westerly, R. I., granite business is booming. One company has put every available man in the town at work on a big contract which it is stated will last a year. The cutters say the outlook for steady work has not been so good in five years as at present.

Cromwell, Conn.—The Connecticut Freestone Quarry has shipped away their last carload of stone. They will now take down their derricks and remove everything to places of safety.

The quarries at Grindstone City, Mich., are now running and large shipments of building stone are being made.

The stone quarry in Henrietta, O., which has been owned by the Kipton Stone Company and managed by M. Sherburne, has been sold to the Cleveland Stone Company. The new management took possession April 9 and are now operating the quarry with about the same men who were employed by Mr. Sherburne. The Cleveland Stone Company made the purchase on account of a particular grade of stone found there which is not found in abundance in their other quarries.

Messrs. C. F. Duffy, L. D. Phillips and Benjamin Hamm, who have for some years been assistants in the granite works of the T. A. Jones & Jewell Granite Company, of Bangor, Me., have assumed control of that plant and, under the firm name of "The Bangor Granite Company," will continue the business without interruption.

D. J. Herter succeeds Isaac Whitney in the marble works at Grinnell, Iowa. The firm now is Leins & Herter.

Hillsdale, Mich.—E. R. Powers has sold his interest in the marble works to his former partner, A. Winters, and is moving back to Reading where he had retained an interest in the marble works of that place.

Worcester, Mass.—Horace E. Bartlett, administrator, vs. Webb Granite and Construction Company, Worcester, action of tort.

Bay City, Mich., April 23.—It has been mutually agreed to dissolve the partnership between James H. Tennant and Abraham Bate, heretofore known as Bay City Stone Company, and hereafter no obligation incurred by either of said parties will be binding on the other.

Brooklyn, N. Y.—Suit has been begun in the Supreme Court for the voluntary dissolution of the Branford Granite Company, whose place of business is at Branford, Conn. The late contractor, Edward J. Freel, and other Brooklynites were largely interested in the quarry, which with the adjoining land is estimated to be worth $100,000. The Freel estate has a claim for $115,398.58 against the company.

Goshen, Ind.—A peculiar suit was filed in court here, wherein Solomon E. Slaughter, of Ravenna, O., appears as plaintiff, and John B. Slaughter, a well-to-do marble dealer of this city, as defendant. In 1863 the defendant left the parental roof at Ravenna, O., to seek his fortune in the West. Before leaving he was given $500, for which he relinquished all interest in his father's estate, also agreeing to pay 6 per cent. on the $500 until the death of his father. A couple of years ago the old gentleman died, leaving quite an estate. This suit is for the 6 per cent. interest on the $500, amounting to $1,200.

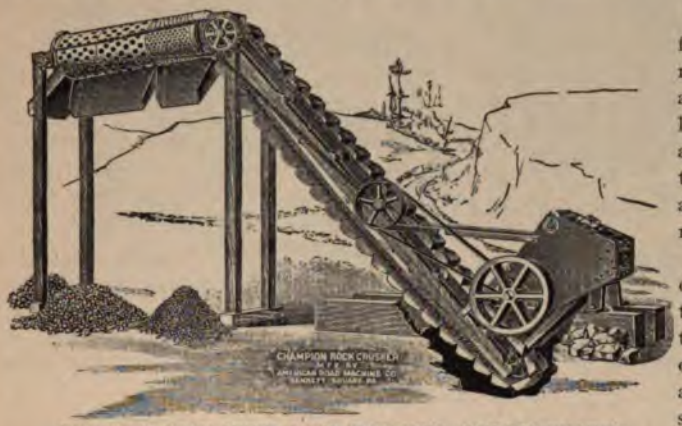
Graveson & Co., dealers in stone, on Hunt street, Covington, Ky., assigned to W. F. Boyd. Assets, $40,000; debts, $35,000. Wm. Goodall was given preferences for $4,750.

Syracuse, N. Y.—One James Tobin has begun suit against Anson E. Alvord to recover $15,000, which sum is the estimated financial equivalent or damages alleged to have resulted from a blast in the Rock cut stone quarry owned by Mr. Alvord.

The creditors of the Acme Slate Company, who purchased the quarry and other property of the said company at assignee's sale, met at Bangor, Pa., and organized a new company under the title of "The Argyle Slate Company."

The second trial of the damage suit of the Sanford Brown estate against the Consolidated Stone Company ended, at Bloomington, Ind., by a disagreement of the jury. The jury had evidence under consideration for about twenty hours. From the first it was evident that they could not agree, the vote standing six for and six against damages, the question of the amount not being considered. The suit was for $10,000 damages, growing out of Brown being thrown from a moving car, which it is alleged was not properly loaded. At the first trial in last De-

Rock Crusher Economy



THE CHAMPION STEEL ROCK CRUSHER, WITH ELEVATOR AND SCREEN.

There is economy in figuring, if you figure right. Before buying a Rock Crusher do a little figuring, not only as to first cost, but as to cost of operating, and probable cost for repairs.

When you figure don't fail to include the **Champion Crusher** the cheapest crusher on the market to operate. Built in several sizes. Seven to thirty tons per hour capacity.

GOOD ROADS MACHINERY CO.,

Mention STONE. **Kennett Square, Pa.**

Catalogue is free for the asking. It will interest you.

THE PULSOMETER STEAM PUMP

Catalogue on Application.
Correspondence Solicited.

"The Contractor's Friend."

OFTEN IMITATED——NEVER EQUALED.
OVER 20,000 IN USE.

Recent Important Improvements.

The Handiest, Simplest, and Most Efficient Steam Pump for General Mining, Quarrying, Railroad, Irrigating, Drainage, Coal-washing, Tank-filling, Paper Mill, Sewer and Bridge Contractors' Purposes, etc., etc.

Muddy or gritty liquids handled without injury to the Pump.

PULSOMETER STEAM PUMP CO.,

135 Greenwich St., - NEW YORK.

Please mention STONE when you write to advertisers.

cember a verdict for $1,500 was secured, but was set aside by consent for fear of error. Henley & Wilson, attorneys for the Brown estate, say that they will insist upon another trial as soon as possible.

Cincinnati, O.—The hunt has begun for the $25,000 supposed to have been left by Hermit John Sarvey, who died March 1 in his room on Boal street. Sarvey was a marble-cutter. The attorney in the case will apply for an administrator of the estate. It is believed that Sarvey intrusted his money to a priest, who is known, with whom some correspondence has been held, who acknowledges an indefinite debt.

Holyoke, Mass.—Patrick F. Meade, stonecutter, reported to have applied for relief in bankruptcy.

Booneville, Mo.—R. L. Moore, marble, reported to have given deed of trust of real estate for $1,200.

Columbus, O.—John Farmer, stone, etc., reported to have given warranty deed for $2,300.

Hot Springs, S. D.—Fred T. Evans, hotel and quarries; hotel, etc., sold by order of court.

Mexico, Mo.—A. K. Luckie, marble and granite, reported to have given real estate deed of trust for $800.

Norfolk, Neb.—M. B. Cox, marble, reported to have recorded chattel mortgage for $178.

Lehman, Pa.—William W. Shaw, marble, reported to have given executions for $300.

Gallatin, Mo.—Tillery & Brown, marble and granite; N. B. Brown gave real estate mortgage for $500.

West Union, O.—J. L. Richards & Son, marble, reported to have given lien for $731.

Charleston, S. C.—O. L. Viett, marble and granite works, reported to have released real estate mortgage for $3,500.

The officers and directors of the new company are: President, Wm. Harding, Sr., of Pen Argyl; vice president and secretary, R. J. Vasseur, of Wind Gap; treasurer, Thomas Masters, of Pen Argyle; directors—C. Miller, of Nazareth; A. O. Allen, of Portland. G. W. Underhill, of New York; J. H. Shull, of Stroudsburg; Frank Hower, of Danielsville, and Wm. Lobb, Sr., of Pen Argyl. Application will be made to the State Department for a charter, with a capital stock of $50,000. After the charter is secured and the company is properly organized under it, the future policy in reference to the operation of the quarry will be decided upon.

Columbia, Ky.—Creed Hood will develop onyx quarries.

Jacob Wineman, of East Greensburg, Pa., has leased the Karnes stone quarry at Bagley. He expects to put a force of men at work soon to quarry stone for the new railroad.

Riverside, Cal.—The Southern Pacific Railroad Company has closed a deal for the Casa Blanca granite quarries, which is near their line as surveyed to Corona, Cal. The plan is believed to be to quarry rock for the harbor work at San Pedro.

Wheeling, W. Va.—Charles Seabright and Joe Shuckman have opened a stone quarry.

W. Balvin Bloss is opening a new slate quarry on his farm near New Tripoli, Pa., on the line of the S. & L. railroad, ten miles west of Pen Argyl, that promises good results.

Binghamton, N. Y.—As a sign of improving times, a new industry is about to start in this city. Messrs. Ingalls & McClintock, who are running a large and successful stone business in Oneonta, N. Y., have leased for a term of years property and expect to start May 1 a first-class stone-cutting, stone-sawing and stone-planing works. They will employ a large number of men when they get fully under way. Both members of the firm are young and enterprising men with large experience in the stone business, Mr. Ingalls having been engaged in this line at Oneonta for several years, while Mr. McClintock has represented the Cleveland Stone Company of Ohio.

Jonesboro, Me.—G. S. Havey, agent for the Booth Bros. and Hurricane Isle Granite Company, is making preparations to open the quarry formerly owned by Fish Bros.

Dan Cronin, the well known and experienced quarryman, has opened up the famous Winters stone quarry south of Mt. Pleasant, Iowa, and will furnish first-class building stone at $1.50 per perch, delivered.

Though a boom in the stone business in the vicinity of Albion, N. Y., still looks afar off, the outlook this spring is much better than last, and one of the most extensive quarry owners of

WATERPROOF
GRAPHITE GREASE
FOR WIRE ROPES, GEARS, ETC.

An unequaled lubricant which will not wash off. It may pay you to send for circulars.

JOS. DIXON CRUCIBLE CO., JERSEY CITY, N. J.

A. LESCHEN & SONS ROPE CO.,

—Manufacturers of—

All genuine Hercules Wire Rope is made with a Red Strand.

Best on Earth.

[Trade Mark Registered.]

920 & 922 N. Main St., ST. LOUIS, MO.

Send for Catalogue. —CHICAGO OFFICE & WAREHOUSE: 19-21 S. CANAL ST.— Correspondence Invited

BRODERICK & BASCOM ROPE CO.,

—MANUFACTURERS OF—

The Most Durable Rope made.

IT HAS NO EQUAL.

AND ALL GRADES OF

Iron and Steel Ropes and Street-Railway Cables.

ST. LOUIS, MO.

Please mention STONE

Albion states that his orders now on hand exceed his whole last year's output.

At the quarries of the Winnsboro Granite Company, Rion, S. C., there has recently been discovered a vein of "pink granite" of superior quality. This granite is said to equal in color that imported from Scotland, and is of a finer grain and closer texture.

The Ionia, Mich., Sandstone Company is equipping its quarries, located between Ionia and Lyons, with all the improved machinery, and claim a capacity of from six to eight carloads of dressed stone per day.

Norwalk, O.—The contract for stone for the Norwalk water works reservoir has gone to the Clarksfield Stone Company, and the quarries there have been started again with a full force.

Greensburg, Ind.—A contract has been made whereby the Hollensbee Stone Company will operate twenty-eight miles of the E. & R. railroad, which will greatly facilitate the handling of the output of the big quarry.

Slateville, Pa.—The Foulk Jones & Sons quarry has been idle since April 1, but water is being pumped out preparatory to commencing work again at an early day. The company will again take charge of operations themselves.

Easton, Pa.—The Chapman slate quarries, 300 men, and the Chester slate quarry, 55 men—both near Bath—have shut down.

James A. Smith, superintendent of the Smith & Brainerd Marble Company's works at Belden's, Vt., who was nominated to the United States consulship at Leghorn, Italy, is making preparations for his departure. He will close his connection with the marble company at an early day and expects to sail from New York with his family late in May.

Chicago, Ill.—From an interview with Inspector Clarke of the supervising architect's office, architect Cobb is led to expect that he will be in possession of the postoffice site by the first of July. When he is reasonably certain of possession within thirty days he will advertise for bids for the foundations. He estimates that the foundations can be put in under the direction of Gen. Wm. S. Smith by the spring of 1898. It is his purpose, if matters work smoothly, to advertise for the superstructure some time next fall. About a million dollars' worth of granite will be used and there will be the liveliest kind of competition for the contract between Western and Eastern quarry owners. The Chicago granite contract will be the largest ever competed for in America.

Patrick F. Burke, of Rutland, Vt., died April 24, at the age of 23 years. Mr. Burke was a young man of ambition and promise. He had been employed by the True Blue Marble Company for the past two years as general agent and had traveled through nearly all of the Western States. He expected to enter Columbia law school the coming fall. His parents, four brothers and two sisters survive him.

Representative A. J. Kern, of Lehigh county, introduced a bill into the Pennsylvania legislature, which has for its object the protection of employes in slate quarries. The bill provides that the governor shall appoint a board of examiners, of "five reputable slate quarrymen, operators or miners," to serve one year. Each examiner and a clerk whom they could employ would receive $5 a day and mileage during the time devoted to the examination of candidates for a $1,500 inspectorship with a term of five years. The inspector must be thirty years old and have had at least five years' practical experience in the slate quarries. Traveling expenses are to be allowed to him, and he would be required to devote all his time to inspecting the quarries, for which, with minute detail, the bill specifies regulations.

Lone Rock, Wis.—James Kirkpatrick, of Belmont, Wis., is here negotiating the purchase of the Hood, Huntley and Reyman stone quarries northeast of this village. Should he make the the purchase, he will put a crew of men at work and run a track to the quarries.

Janesville, Wis.—The liabilities of R. M. Hoar of Janesville, who made an assignment of his two stores and stone quarry, are $100,000, and the assets are $60,000.

Lewiston, Me.—It is reported that a New York syndicate has leased the Sargent quarry at Mount Tuck, Prospect, and will at once begin operations there.

Wilkes-Barre, Pa.—Charles Deitrick has purchased an interest in the Empire granite quarries at Barre, Vt.

San Antonio, Tex.—Charles Mierow, marble and granite, reported to have given judgment for $387.

Salesrooms, 143 LIBERTY ST. NEW YORK

HOISTING MACHINERY FOR QUARRYING,

Mining, Coal Handling, Pile Driving, Bridge Building, Log Hauling, and for General Contractors' Use.

Send for **Illustrated Catalogue** giving full description, etc.
CORRESPONDENCE SOLICITED.

Lambert Hoisting Engine Co.
SUCCESSORS TO
W. A. Crook & Bros. Co.
117-123 Poinier Street.
Newark, N. J.

Improved Electric Hoists, single and double, Patent Friction Drum, compound, geared with brakes and reversible for general Hoisting, Mining Purposes and Suspension Cableways. . . .

Derricks and Hoisting Machines

FOR QUARRYMEN AND CONTRACTORS.

SEND FOR CATALOGUE.

Steam Hoisting Engines.
Horse Power Hoisters.
Hand Power Hoisters.
Derricks
Derrick Irons.
Sheaves and Tackle Blocks.
Rooter Plows.
Centrifugal Pumps.

Dobbie Foundry and Machine Co.,

NIAGARA FALLS, N. Y.

NEW YORK OFFICE:—38 Dey St.

$150 CASH, and **$200** in finished Granite Monument, or Dimension Stone,

will take in exchange a

$400 New Piano

One of the most popular and highest grade instruments made. Still in wareroom. Address

TRADER, care STONE.

Please Mention STONE when you write to advertisers

The Patrick Ryan slate quarry at Guilford, Vt., has been leased by Mr. Jones, of New Britain, Conn., and Jones & Owens, of Granville, N. Y. They will at once equip it with modern machinery, including steel drill, steam pump and derricks, and sink the quarry deeper so as to reach the best of the slate. They expect to get to making slate in a couple of months, and when under full headway to employ fifteen to twenty men.

E. J. Humphries has purchased the Funk stone quarry at West Newton, Pa. He will also erect a mammoth brick plant.

East Longmeadow, Mass.—J. F. Norcross severed his connection with the Norcross quarry after fifteen years' continuous service as superintendent. His resignation is much regretted by the workmen. He has made no definite plans for the future. O. Louis Wolcott takes the position vacated by Mr. Norcross.

Young & Lovell, of Ottawa, Ill., have purchased two lots where they will establish a marble yard. They will at once erect shops, and as soon as the building is completed they will move their business from Ottawa to Pontiac, Ill.

Montrose, Pa.—W. H. Perry, of Concord, N. H., has purchased the marble and granite works of DeLong & Sauter, and will continue the business under the name of Perry's Crystal Granite Works.

Toledo, O.—The contract for St. Paul's M. E. Church, for which architect E. O. Fallis made plans, was awarded to A. Bently & Sons at $49,000 for the entire structure complete except heating, plumbing, pews, organ and electric lighting.

New Orleans, La.—A Chicago firm was the lowest and successful bidder for the work of improving Sabine harbor, Texas. There were ten bidders for the work, the lowest of which was the firm of Christie & Lowe, Chicago, whose bid was $792,000. McArthur Bros., of Chicago, also put in a bid. The work to be done includes 160,000 square yards of brush mattress work, 300,000 tons of riprap stone, 35,000 tons of granite, and 500,000 cubic yards of dredging.

Leading stone contractors of Chicago met 17th ult. and organized the Chicago Cut Stone Contractors' Association. Following are the officers: President, Alexander Graham; vice pres

HOISTING ENGINES.
GEARED LOCOMOTIVES
TRAVELING DERRICK CARS.
DERRICK IRONS ETC.

MANUFACTURED BY
THE JOHN F. BYERS MACHINE CO.
RAVENNA, OHIO. U.S.A.

HOISTING, MINING, BRIDGE ERECTING,
Dock Building, Pile Driving, Coal Hoisting and Quarry Engines

of any power, Sugar Cane transferring engines, transferring machines for depositing cane from car to carrier, with my improved Patent Friction Drums with or without Boilers. Any amount of reference given. Established 1870. Send for Catalogue.
J. S. MUNDY, Newark, N.J. 1744 Market St., Philadelphia, Pa., 22 Light-st. Baltimore, Md., 117 Water-st., Pittsburgh, Pa., 349 S. Jefferson-st., Chicago, Ill., 715 N. Second-st., St. Louis Mo., 34 Fremont St., San Francisco, Cal., 85 Front-st. Portland, Ore., 218 Congress-st., Boston, Mass.

I SEE YOU'RE BACK
from a trip over the
MONON ROUTE

Solid vestibuled trains Daily, heated by steam, illuminated by Pintsch light,
BETWEEN
CHICAGO
INDIAN'POLIS
CINCINNATI
LOUISVILLE
And the SOUTH.
Only line to
West Baden and French Lick Springs,
The Carlsbad of America.
W. H. McDoel, V. P. and Gen. Mgr.
Frank J. Reed, Gen. Pass. Agt.
City Ticket Office,
232 CLARK STREET, CHICAGO.

LIDGERWOOD HOISTING ENGINES

Are Built to Gauge on the DUPLICATE PART System.

STANDARD For QUALITY And DUTY.

CABLEWAYS, Hoisting and Conveying Devices

Especially adapted for QUARRYMEN.

LIDGERWOOD MFG. CO.,

96 LIBERTY STREET,

NEW YORK.

CHICAGO, Old Colony Bldg.
BOSTON, 197-203 Congress St.
PHILADELPHIA, 15 N. Seventh St.
NEW ORLEANS, Hennen Bldg.
PORTLAND, ORE., 40 First St.
CLEVELAND, O., 26 S. Water St.

THE NEW ALBANY M'F'G. CO.

Manufacturers of

Steam and Electric Traveling Cranes for any purpose.

Our larger cranes are Especially adapted to

STONE SAW MILL USE.

The smaller electric cranes are very economical for *Storage Yards and Cutting Sheds* in cities where current can be had (by meter) from public power station.

We build all sizes, from *three to twenty-five tons capacity*, and *any width of span* up to 60 feet.

DON'T BUY UNTIL YOU GET OUR PRICES.

We also build

WARDWELL CHANNELERS, STONE PLANERS, SCREW FEED SAW GANGS, HEAVY POWER HOISTS AND DERRICK IRONS.

THE NEW ALBANY MFG. CO., New Albany, Ind.

Please Mention STONE when you write to advertisers

ident, Edward Chambers; secretary, J. J. Edgeworth; treasurer, John Tait.

Montpelier, Vt.—The troubles between the granite manufacturers and the granite-cutters, which have been increasing of late, are still unsettled. Eighty men employed by the Capital Granite Company, of this city, went out on 14th inst. because a disagreement had arisen over the time and wage schedule.

Berlin, Wis.—The personal property of the Berlin and Montello Granite Company, that was advertised for sale on an execution, was sold for $2,969, the amount of the judgments held by Berlin and Montello laborers. The property was sold to C. S. Morris, who holds judgments obtained in the Circuit Court for $7,590. It was expected that the sale would be postponed so that the company might settle, but several laborers refused to wait.

The Chicago Journeymen Stone-Cutters' Association will hereafter take control of the setting of all cut stone that comes out of the various stoneyards in the city of Chicago, and where bricklayers refuse to back up the stone with brick "members of this organization are hereby authorized to do the work themselves." Several years ago, the stone-cutters claim, they not only trimmed the stone used in the erection of buildings, but also did the setting. Then the Bricklayers' and Stone-cutters' Union took up the question and made a law that members of that organization should do all the setting.

Milo Junction, Me.—John L. Williams and Charles Webb, of Danville, P. Q., are in Brownville settling the affairs of the Highland slate quarry. This quarry shut down last spring, but the new proprietor says it can be operated on a paying basis. Mr. Williams will have charge of the operations and will furnish employment to fifty men. The quarry will start up at once.

The Gouverneur (N. Y.) Marble Company have started up their quarry and mill on full time. The mill has been running night and day of late, but the quarry proper has been shut down for two and a-half months. A good season is expected and both the mill and quarry will be run full time. Thirty men are employed.

Boston, Mass.—The building contractors and union stone-cutters have combined against what they claim is the importation of convict cut-stone labor into this city. It is claimed that

The Publishers' Printing Co.

327 Dearborn Street
CHICAGO

Do all
Kinds of

Book and Job Printing

Half-tone work
a specialty

Send thirty cents in stamps or cash and get a beautifully illustrated Souvenir of "Western Yachts and Yachting."

50 pp. Illustrations
50 pp. Descriptive Matter

QUARRY PUMPS.

CHEAPEST. HANDIEST. SIMPLEST. PUMPS.

Handling Dirty, Gritty and Sandy Liquids, without Wear, Oil or Care. Pumping outfits for Contractors, Mining, Irrigating, Railroad, Quarry, Drainage and Manufacturing purposes. Second-hand Engines, Boilers, Pumps, and other Machinery always on hand. Exchanging.

MASLINS, 165-167 First St., Jersey City, N.J.

VANDUZEN STEAM JET PUMP
THE BEST IN THE WORLD.
Pumps Any Kind of Liquid.
Always in Order, never Clogs nor freezes. Every Pump Guaranteed.
10 SIZES.
200 to 12000 Gallons per Hour.
Cost $7 to $75 each. Address
THE E. W. VANDUZEN CO.,
102 to 108 E. Second St., Cincinnati, O.

N. W. GODFREY,

Miner and Shipper of Silica,

Washed and Screened.
THOMAS & ECKERSON, AGENTS.
New York Office, 33 and 35 West Thirtieth Street.

STONE and MINING MACHINERY.

Stamp Mills,
Concentrating Machinery,
Smelting Machinery,
Lixivating Machinery,
Cyanide Machinery,
Rock Breakers,
Engines and Boilers

Traveling Cranes,
Derricks,
Derrick Powers,
Planers,
Lathes,
Wire Rope and Fittings,
Rubbing Beds.

Manufactured by

H. H. SCOVILLE & CO.,

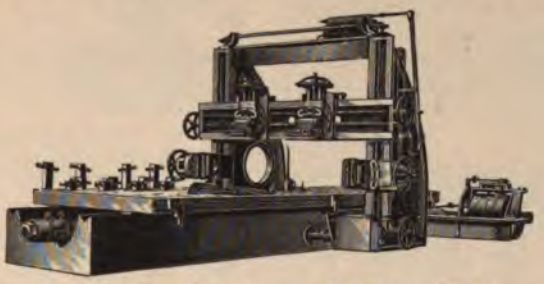
CHICAGO,

TELEPHONE MAIN 4805.

250-252-254 South Clinton Street.

LINCOLN IRON WORKS, RUTLAND, VERMONT.

ALL KINDS OF ESTIMATING PROMPTLY ATTENDED TO



NEW YORK OFFICE,
Havemeyer Building.

Stone-Working Machinery.

PLANERS, GANG SAWS, DIAMOND SAWS, RUBBING BEDS, DERRICKS,
TRAVELING CRANES, HOISTING POWERS.

Arithmetic for Stone Dealers.

Calculations Made Easy,
Errors Avoided,
Time and Labor Saved by

Ropp's
COMMERCIAL
CALCULATOR.

The most useful, complete and *practical* work on Figures ever published. Specially useful to stone, marble, granite and slate dealers and quarrymen. Nearly every problem in business *already figured out.* Arithmetic made so plain by *original,* short and simple methods, that a child can comprehend it. Worth its weight in gold to young and old. Nearly half a million copies sold. Accompanied by account book, silicate slate, pocket, etc. Bound in elegant leather, pocket size. Address

THE D. H. RANCK PUB. CO., 358 Dearborn St., Chicago.

Sent by Mail on Receipt of Price, $1.

Please mention STONE when you write to advertisers.

the cut stone being used in the erection of the new Brazer building represents the handiwork of Illinois convicts in Joliet. E. R. Brainerd, the sub-contractor who furnishes the stone for the building, lives in Chicago, and none of his representatives here will talk on the matter.

New York City.—The Reliance Labor Club of Marble Cutters, Whitestone Association of Marble Polishers, and Compact Labor Club of Marble Cutters' Helpers have submitted new yearly agreements to their employers. These agreements, which are to go into effect on May 1, are indorsed by the Board of Walking Delegates, District Assembly 253 of the Knights of Labor, and the building trades section of the Central Labor Union, and will be enforced by strikes if the employers reject them. The marble cutters ask $4 a day, the same wages they have been receiving, and the polishers and helpers each demand an advance of 25 cents a day. The present wages of the polishers are $3 and of the helpers $2.25 a day.

Cedar Rapids, Iowa.—John Osborn has made a discovery near Walker, in the northern part of this county, that promises to be a most valuable one, having found a deposit of marble which is known to cover at least five acres. The depth of the quarry has not yet been ascertained.

West Pawlet, Vt.—The slate industry seems to be struggling ahead, notwithstanding the recent shut down. Parties have lately opened and are successfully operating the old quarry on the Henry Smith farm, and negotiations are being made for a lease of the red slate quarries owned by W. C. White at Slateville.

New Jersey legislature has killed a bill requiring stone for public buildings to be dressed in the state.

All the striking employes of the Elyria Stone Company at Grafton, O., went to work at "summer wages." The Grafton Stone Company is having some trouble with its locked out men who are destroying the company's property.

At a meeting of the directors of the Northville, N. Y., Granite and Marble Company the following officers were elected: President, Erastus Darling; vice president, James A. Cole; treasurer, William Hollearn; secretary, L. N. Johnson. The affairs of the corporation were reported to be in a satisfactory condition and work will be pushed forward the coming year.

The Joyce-Cridland Co.

Dayton, O.

Manufacturers of

Patent Lever, Compound Lever, Screw and Hydraulic

JACKS

for Stone-Yard Use.

Illustrated catalogue free.

We Need The Following

Issues of STONE to complete our files:

DECEMBER	1892
FEBRUARY	1893
MARCH	1893
APRIL	1893
MAY	1893
AUGUST	1893
SEPTEMBER	1893
OCTOBER	1893
NOVEMBER	1893
JANUARY	1894
MAY	1894
JULY	1894
JANUARY	1895
MAY	1895

We will extend the subscription term of any of our subscribers copy for copy. That is, for each one of these issues we will tack on one issue to the subscriber's term. If you don't bind the magazine, look over your numbers on hand and send to us any of them here listed, and we will be greatly obliged to you.

GATES ROCK AND ORE BREAKER

For **Crushing Stone** in all its forms **is right**, and there is only **one right.**

The Latest Model is Better and Cheaper than ever...

Our **Catalogue** is explicit, and can be had on application.

Designs for Complete Plants Free to Customers...

Our **Jaw** Crushers are also used very extensively

MINING MACHINERY as Manufacturedby us, is of HIGHEST GRADE ONLY.

Write us for information. We can serve your interests satisfactorily.

BRANCH OFFICES:
Bowling Green Offices, New York.
422 Seventeenth St., Denver.
11 Calle de Gante, City of Mexico.
73a Queen Victoria St., London, E. C. England.

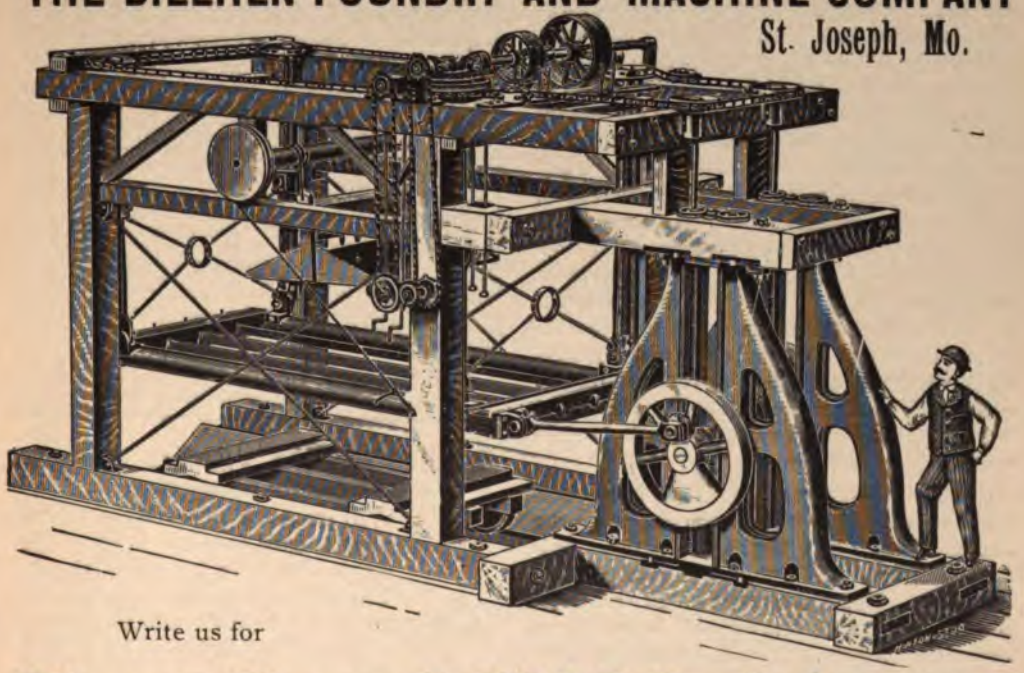
Gates Iron Works

DEPARTMENT T.

650 Elston Avenue, CHICAGO, ILL.

THE BIELHEN FOUNDRY AND MACHINE COMPANY

St. Joseph, Mo.



Write us for

Stone Saw-Mill Machinery

Please Mention STONE when you write to advertisers.

Portland, Me.—At the annual meeting of the Monson-Burmah Slate Company these officers were elected: President, M. W. Clark; treasurer and clerk, L. G. Paine; directors—D. W. Clark, Geo. P. Wescott, M. W. Clark, J. S. Gerrish, P. J. Larrabee, Geo. H. Gookins and L. G. Paine. The season has been a very satisfactory one.

The jury in the Dennie Summit case, at Bloomington, Ind., agreed upon a verdict, 9th inst., the decision being for $4,000, in favor of Summit against the Consolidated Stone Company. The company will ask for a new trial, and if this is refused will appeal at once to the higher court. Summit was injured last July while working with a derrick in the Consolidated quarry, a large stone falling on his foot, the result of which has made him lame for life.

Jefferson Barracks, Mo.—The men working at the Jefferson stone quarry, located at Wickes, Mo., a small station on the Iron Mountain road, nineteen miles from St. Louis, have struck and refuse to work until their wages which are in arrears, have been paid. They are now two weeks behind, and they cannot get any satisfaction as to when they will be paid, so they all went out. There are between thirty and forty men involved and all are married men with families, and it will go very hard on them, as the wages due a lot of them runs from $50 to $60. The Jefferson Stone Company was organized about one year ago, and comprises several well known business men of St. Louis. They purchased this property from Judge Newcomb, which was his residence for several years. They put in a large plant and were prepared to do a very extensive business. Everything went on very smoothly very recently, when Superintendent Daugherty informed the men that he had no money on hand and could make no payment that pay day, and put them off repeatedly. The men worked along for a few days, but saw no signs of coming prosperity, so the strike was decided upon.

Utica, N. Y.—Proceedings have been instituted to dissolve the corporation known as the Empire Granite and Marble Company. William A Turner of Clinton, is president and Henry W. Roberts secretary and treasurer. Most of the stockholders live in Clinton and the immediate vicinity. Upon application of L. M. Martin, attorney for the local stockholders, Judge William E. Scripture has apppointed L. D. Edwards of Waterville, referee, and Robert

Increase your Sawing and Reduce the Cost by Using

"KRUSHITE."

Cuts Faster, Lasts Longer, Gives Better Results than Any Other Material. (See Prices Current.)

A Trial will Demonstrate its Qualities.

FRENIER & LeBLANC, RUTLAND, Vermont.

Locations for Industries.

The name of the Chicago, Milwaukee & St. Paul Railway has long been identified with practical measures for the general upbuilding of its territory and the promotion of its commerce, hence manufacturers have an assurance that they will find themselves at home on the Company's lines.

The Company has all its territory districted in relation to resources, adaptability and advantages for manufacturing, and seeks to secure manufacturing plants and industries where the command of raw material markets and surroundings will insure their permanent success

Mines of coal, iron, copper, lead and zinc, forests of soft and hard wood, quarries, clays of all kinds, tanbark, flax and other raw materials exist in its territory in addition to the vast agricultural resources.

The Chicago, Milwaukee & St. Paul Railway Company owns 6,168 miles of railway, exclusive of second track connecting track or sidings. The eight states traversed by the Company, Illinois, Wisconsin, Northern Michigan, Iowa, Missouri, Minnesota, South Dakota and North Dakota, possess, in addition to the advantages of raw material and proximity to markets, that which is the prime factor in the industrial success of a territory—a people who form one live and thriving community of business men, in whose midst it is safe and profitable to settle.

A number of new factories and industries have been induced to locate—largely through the instrumentality of this Company—at points along its lines. The central position of the States traversed by the Chicago, Milwaukee & St. Paul Railway, makes it possible to command all the markets of the United States. The trend of manufacturing is westward. Confidential inquiries are treated as such. The information furnished a particular industry is reliable.

Address,

LUIS JACKSON,
Industrial Commissioner, C. M. & St. P. R'y,
435 Old Colony Building, CHICAGO, ILL.

Subscribers

Will do us a favor by sending postal card notice when the magazine fails to reach them. The newspaper mails are heavily burdened and consequently slighted by over-worked post-office clerks, and often go astray. We will always send duplicate copies.

Rock Crushers and Screens. Horse Road Rollers.

Street Sweepers and Sprinklers.

Reversible Road Graders. Scrapers and Railroad Plows.

Largest and best established line of "Good Roads" machinery in the world.

AUSTIN & WESTERN CO., Ltd.,

70 No. Carpenter Street, CHICAGO.

ELECTRIC BLASTING

VICTOR ELECTRIC PLATINUM FUSES

Superior to all others for exploding any make of dynamite or blasting powder. Each fuse folded separately and packed in neat paper boxes of 50 each. All tested and warranted. Single and double strength, with any length of wires.

"PULL-UP" BLASTING MACHINE.

The strongest and most powerful machine ever made for Electric Blasting. No. 3 fires 30 holes. No. 4 fires 50 holes. No. 5 fires 100 holes. They are especially adapted for submarine blasting, large railway, quarrying and mining works.

VICTOR BLASTING MACHINE.

No. 1 fires 5 to 8 holes; weighs only 15 pounds, adapted for prospecting, stump blasting, well sinking, etc.

Standard Electric Fuse and Blast Tester, Wire Reels, new design, Leading and Connecting Wire.

—MANUFACTURED ONLY BY—

JAMES MACBETH & CO., No. 128 Maiden Lane, New York City.

Send for catalogue.

THE CONTRACTORS' PLANT MFG. CO.,

129 ERIE STREET,

Buffalo, N. Y.

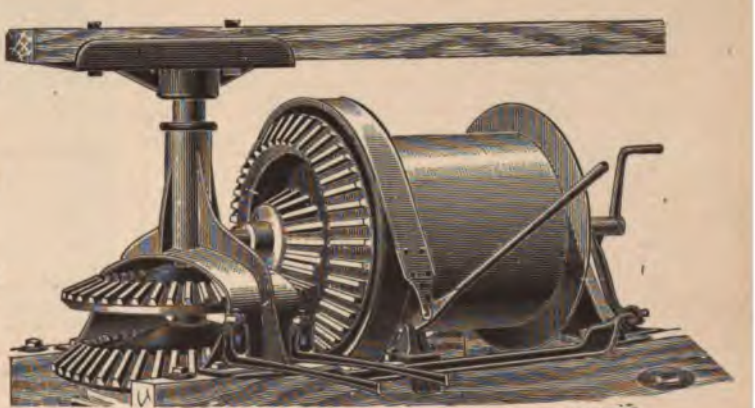
DERRICKS,

Contractors' and Quarrymen's

SUPPLIES.

Horse Power

HOISTING MACHINERY.



XXXVII

C. Owen of Clinton, temporary receiver. Mr. Owen has filed his bond and made an inventory of the assets. Referee Edwards will have a hearing May 30, to take evidence in the case.

John J. Steffen has filed suit to restrain the St. Louis Quarry and Construction Company from selling his property at Knob Lick, Mo., under $1,590.

Houghton, Mich.—It is feared the liabilities of Richard M. Hoar, the embarrassed merchant and quarryman, will reach $75,000. If a good price is obtained for the brownstone quarry at Portage Entry, creditors may be paid in full, otherwise they may not get more the 20 per cent.

Brownsville, Me.—The managers of the Highland quarry have gone to Canada without paying their help. It is reported, however, that they have deposited $25,000 with J. B. Peaks as sureties.

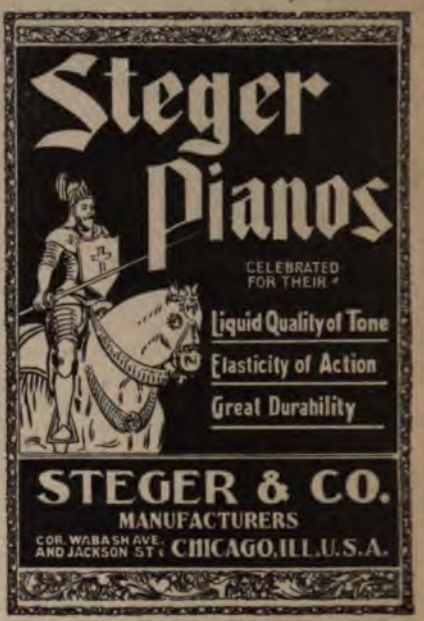
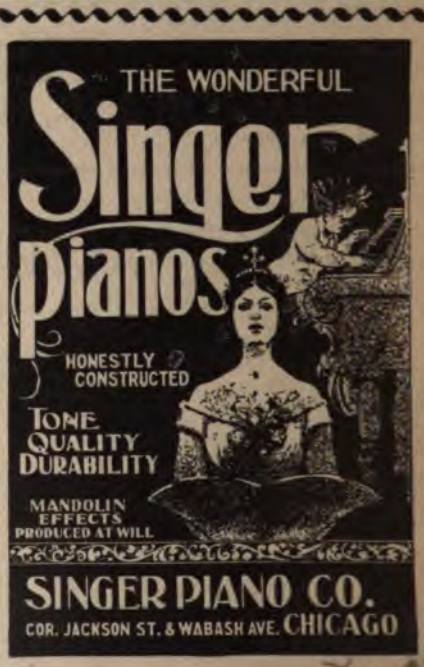
Minneapolis, Minn.—Cook Stone Company, quarry, reported to have recorded chattel mortgage for $225.

Waldoboro, Me.—John P. Glidden, marble, reported to be in bankruptcy.

St. Louis, Mo.—St. Louis Relief Company, manufacturers' plaster casts, reported to have recorded chattel mortgage for $423.

Philadelphia, Pa.—Geo. H. Supplee, marble, reported to have been given judgment for $445.

Beloit, Wis.—Warner P. Elliott for many years a marble dealer in this city, died at his home in Waverly Place, March 26, aged 83 years. He was born in Vermont and came here in 1855.

Baltimore, Md.—William Francis Bevan of Arlington, Baltimore county, died March 27, at his late residence. Deceased was born in 1821, and at 20 years of age was admitted into the firm of Bevan & Sons, established 75 years ago in the marble business.

Stone Mountain, N. C.—The Stone Mountain Granite & Timber Co., has been incorporated, with H. L. Smith of Norfolk, Va., president; G. W. Hinshaw of Winston, N. C., vice president; and Walter Sharp of Norfolk, Va., secretary; for the development of granite quarries, etc. Capital stock $100,000.